

LOAN DOCUMENT

PHOTOGRAPH THIS SHEET

⑥

DTIC ACCESSION NUMBER

LEVEL

INVENTORY

Site Closure Report
IRP Site 43 Bldg. 1200 Former . . .
DOCUMENT IDENTIFICATION
mar 96

DISTRIBUTION STATEMENT A
Approved for Public Release
Distribution Unlimited

DISTRIBUTION STATEMENT

ACCESSION FOR	
NTIS	GRAM <input checked="" type="checkbox"/>
DTIC	TRAC <input type="checkbox"/>
UNANNOUNCED	
JUSTIFICATION	
BY	
DISTRIBUTION/	
AVAILABILITY CODES	
DISTRIBUTION	AVAILABILITY AND/OR SPECIAL
A-1	

DISTRIBUTION STAMP

DATE ACCESSIONED

DATE RETURNED

20001121 059

DATE RECEIVED IN DTIC

REGISTERED OR CERTIFIED NUMBER

PHOTOGRAPH THIS SHEET AND RETURN TO DTIC-FDAC

H
A
N
D
L
E

W
I
T
H

C
A
R
E

DRAFT FINAL

Site Closure Report

IRP Site 43 Building 1200 Former Diesel UST Site



Edwards Air Force Base
California

Prepared For

Air Force Center for Environmental Excellence
Technology Transfer Division
Brooks Air Force Base
San Antonio, Texas

and

Edwards Air Force Base
California

March 1996



**PARSONS
ENGINEERING SCIENCE, INC.**

9404 Genesee Ave., Suite 140 • La Jolla, California 92037

AQ M01-02-0232

DEFENSE TECHNICAL INFORMATION CENTER
REQUEST FOR SCIENTIFIC AND TECHNICAL REPORTS

Title

AFCEE Collection

1. Report Availability (Please check one box)

- ☒ This report is available. Complete sections 2a - 2f.
☐ This report is not available. Complete section 3.

2a. Number of
Copies Forwarded

1 each

2b. Forwarding Date

July/2000

2c. Distribution Statement (Please check ONE box)

DoD Directive 5230.24, "Distribution Statements on Technical Documents," 18 Mar 87, contains seven distribution statements, as described briefly below. Technical documents MUST be assigned a distribution statement.

- ☒ DISTRIBUTION STATEMENT A: Approved for public release. Distribution is unlimited.
- ☐ DISTRIBUTION STATEMENT B: Distribution authorized to U.S. Government Agencies only.
- ☐ DISTRIBUTION STATEMENT C: Distribution authorized to U.S. Government Agencies and their contractors.
- ☐ DISTRIBUTION STATEMENT D: Distribution authorized to U.S. Department of Defense (DoD) and U.S. DoD contractors only.
- ☐ DISTRIBUTION STATEMENT E: Distribution authorized to U.S. Department of Defense (DoD) components only.
- ☐ DISTRIBUTION STATEMENT F: Further dissemination only as directed by the controlling DoD office indicated below or by higher authority.
- ☐ DISTRIBUTION STATEMENT X: Distribution authorized to U.S. Government agencies and private individuals or enterprises eligible to obtain export-controlled technical data in accordance with DoD Directive 5230.25, Withholding of Unclassified Technical Data from Public Disclosure, 6 Nov 84.

2d. Reason For the Above Distribution Statement (in accordance with DoD Directive 5230.24)

2e. Controlling Office

HQ AFCEE

2f. Date of Distribution Statement
Determination

15 Nov 2000

3. This report is NOT forwarded for the following reasons. (Please check appropriate box)

- ☐ It was previously forwarded to DTIC on _____ (date) and the AD number is _____
- ☐ It will be published at a later date. Enter approximate date if known. _____
- ☐ In accordance with the provisions of DoD Directive 3200.12, the requested document is not supplied because: _____

Print or Type Name

Laura Peña

Signature

Laura Peña

Telephone

210-536-1431

(For DTIC Use Only)

AQ Number

M1-02-0232

CONTENTS

		<u>Page</u>
1	INTRODUCTION.....	1-1
1.1	Scope and Objectives	1-1
1.2	Report Organization.....	1-3
2	SITE DESCRIPTION AND HISTORY	2-1
2.1	Site Description.....	2-1
2.2	Site Geology	2-1
2.3	Previous Site Investigations	2-1
3	SITE CLOSURE SAMPLING AND ANALYSIS ACTIVITIES	3-1
3.1	Site Closure Borehole Locations and Sampling Depths	3-1
3.2	Drilling, Sampling, and Equipment Decontamination.....	3-1
3.3	Field and Laboratory Data Quality Assurance/Quality Control	3-3
3.4	Soil Sample Analysis	3-4
3.5	Data Validation	3-4
3.5.1	Chain-of-Custody Check	3-4
3.5.2	Holding Time Check	3-5
3.5.3	Analytical Report Review.....	3-5
3.5.4	Review of Quality Control Samples.....	3-5
3.5.4.1	Field Duplicate	3-6
3.5.4.2	Trip Blanks.....	3-6
3.5.4.3	Rinseate Blanks	3-6
3.5.5	Matrix Spike/Matrix Spike Duplicate Analysis.....	3-6
4	CONCLUSIONS AND RECOMMENDATIONS	4-1
4.1	Laboratory Results	4-1
4.2	Conclusions.....	4-1
4.3	Recommendations	4-1
5	REFERENCES	5-1

FIGURES

<u>Figure</u>	<u>Description</u>	<u>Page</u>
2.1	IRP Site 43 Building 1200 Previous Borehole and Bioventing System Location.....	2-2
3.1	IRP Site 43 Building 1200 Site Closure Borehole Locations.....	3-2

TABLES

<u>Table</u>	<u>Description</u>	<u>Page</u>
1.1	California Regional Water Quality Control Board, Soil Cleanup Standards (mg/kg or ppm)	1-2
3.1	Soil Sample Analytical Methods and Practical Quantitation Limits	3-4
4.1	Soil Analytical Results, December 1995 IRP Site 43, Building 1200 Former Diesel UST Site Edwards AFB, California	4-2

APPENDICES

<u>No.</u>	<u>Description</u>
A	Closure Sampling and Analysis Plan for IRP Site 43, Building 1200 Former Diesel UST Site, Edwards AFB, California
B	Field Borehole Logs
C	Laboratory Analytical Results

SECTION 1

INTRODUCTION

1.1 SCOPE AND OBJECTIVES

During the past 2 years, Edwards Air Force Base (AFB), California has participated in the Air Force Bioventing Pilot Test Initiative project. Sponsored by the Air Force Center for Environmental Excellence (AFCEE) at Brooks AFB, Texas, the project included conducting more than 135 *in situ* bioventing pilot tests at 48 Air Force installations throughout the country. These tests were designed to collect data on the effectiveness of bioventing for the remediation of soil contaminated with fuel hydrocarbons (e.g., JP-4 jet fuel, diesel fuel, gasoline, and heating oil).

One-year-long bioventing pilot tests have recently been concluded at three Edwards AFB sites, including the Installation Restoration Program (IRP) Site 43 Building 1200 Former Diesel Underground Storage Tank (UST) Site. This site closure report has been prepared by Parsons Engineering Science, Inc. (Parsons ES) to support a closure recommendation for IRP Site 43. This recommendation is based on analytical results obtained through implementation of a site-specific closure sampling and analysis plan (SAP), (Parsons ES, 1995). Regulatory soil cleanup standards for fuel-hydrocarbon-contaminated soils have been established by the California Regional Water Quality Control Board (RWQCB, 1995) and adopted by Kern County Environmental Health Services Department (Kern County). Attainment of these standards, which are summarized in Table 1.1, signifies that the site remediation has been completed, and that closure of the site may be requested. The closure SAP was reviewed and approved by Kern County staff prior to implementation. A copy of the SAP is provided as Appendix A. The closure SAP presented a plan for confirmation soil sampling and analysis to document the effectiveness of soil remediation at this site and to demonstrate compliance with regulatory requirements for closure.

Confirmation soil sampling was conducted approximately 14 months after completion of the bioventing pilot test for the project site. Soil sampling entailed drilling two boreholes to a depth of 25 feet, sampling soil at 5-foot intervals and analyzing selected samples for fuel constituents to support site closure. All of the laboratory test results, including those for matrix, rinseate, and trip blanks, were nondetect. Based on these results, site remediation activities have been effective enough to support closure of the subject UST site.

TABLE 1.1
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SOIL CLEANUP STANDARDS ^{a/}
(MG/KG OR PPM)
IRP SITE 43
EDWARDS AFB, CALIFORNIA

	Distance Above Groundwater (ft) ^{b/}		
	<40	40-150	>150
SOILS ABOVE DRINKING WATER	LEVEL A ^{c/}	LEVEL B	LEVEL C
BTEX ^{d/} + FUEL ADDITIVES ^{e/}	1 x MCL ^{g/}	10 x MCL	100 x MCL
TPH ^{f/} (Carbon Range)	(ppm) ^{h/}	(ppm)	(ppm)
C4-C12	10	100	1000
C13-C22	100	1,000	10000
C23+	1,000	10,000	10,000
SOILS ABOVE NON-DRINKING WATER ^{i/}	LEVEL D		
	(FOR ANY DEPTH TO GROUNDWATER)		
BTEX + FUEL ADDITIVES	100 x MCL		
TPH (Carbon Range)	(ppm)		
C4-C12	1,000		
C13-C22	10,000		
C23+	15,000		

Modified from: RWQCB, 1995.

- a/ Use of this table assumes the original source has been removed and an adequate site assessment has been completed.
- b/ Minimum clean interval below impacted area to be determined on a site-specific basis by Regional Board staff, generally 40' above drinking waters and 20' above non-drinking waters.
- c/ Soil levels below the appropriate levels in this table require no action, soil levels above the appropriate levels in this table must be remediated to or below provided levels, or a site-specific analysis must be conducted, or justification provided to determine more appropriate levels for an individual site. Groundwater monitoring may be required if soil contamination linkage to groundwater impact has been confirmed.
- d/ BTEX = Benzene, toluene, ethylbenzene, and xylenes, respectively. BTEX to be analyzed by EPA Method 8020, or EPA Method 8260 (usually to confirm positive benzene). For BTEX or FA, each component is not to exceed 1, 10, or 100 times its MCL as specified.
- e/ Fuel additives = lead (Pb), ethylene dibromide (EDB), etc., including other components (i.e., PAH) of petroleum products which have MCLs.
- f/ MCL = Maximum contaminant levels.
MCLS (ppm) for benzene = 0.001 toluene = 0.1, ethylbenzene = 0.68, xylenes = 1.75, Pb = 0.015 Fuel Additives: (ppb) EDB = 0.02, PAH = 0.2
- g/ TPH = Total petroleum hydrocarbons. For TPH, the total allowable for each range is not to be exceeded and the overall total is not to exceed the given value for the heavier TPH (C23+). TPH to be analyzed by EPA Methods 418.1 and 8015 (Modified). Ranges of TPH to be analyzed by GC/MS carbon range methods or EPA Method 8015 (DHS Modified). PAH to be analyzed by EPA Method 8310.
- h/ ppm = parts per million.
- i/ Use of Non-Drinking Water Levels are dictated by either water characteristics as defined and exempted under SWRCB Resolution 88-63 (TDS > 3000 mg/L, deliverability < 200 gal/day, or existing contamination that cannot be reasonably treated), or as agreed upon by Regional Board staff for use at a particular site.

1.2 REPORT ORGANIZATION

This site closure report consists of five sections, including this introduction, and three appendices. Section 2 includes a site description, history, and summary of previous investigations and remediation activities. Section 3 is a description of site closure sampling activities that were conducted at the site. Section 4 contains a summary of closure sampling analytical results and a recommendation for site closure. References used for preparation of this study are provided in Section 5. Appendix A presents a copy of the closure SAP for Site 43. Appendix B provides copies of site borehole logs, and Appendix C presents laboratory analytical data for site environmental and quality assurance (QA) samples.

SECTION 2

SITE DESCRIPTION AND HISTORY

2.1 SITE DESCRIPTION

Building 1200 is located on Edwards AFB between Wolfe Avenue to the northwest and the main taxiway to the southeast. Building 1200 houses the flightline manager operations facility. The former UST area is located to the west of Building 1200, within IRP Site 43. The former 165-gallon UST was used to store diesel fuel for an emergency generator located adjacent to Building 1200. The former diesel tank location, with respect to Building 1200, is shown on Figure 2.1.

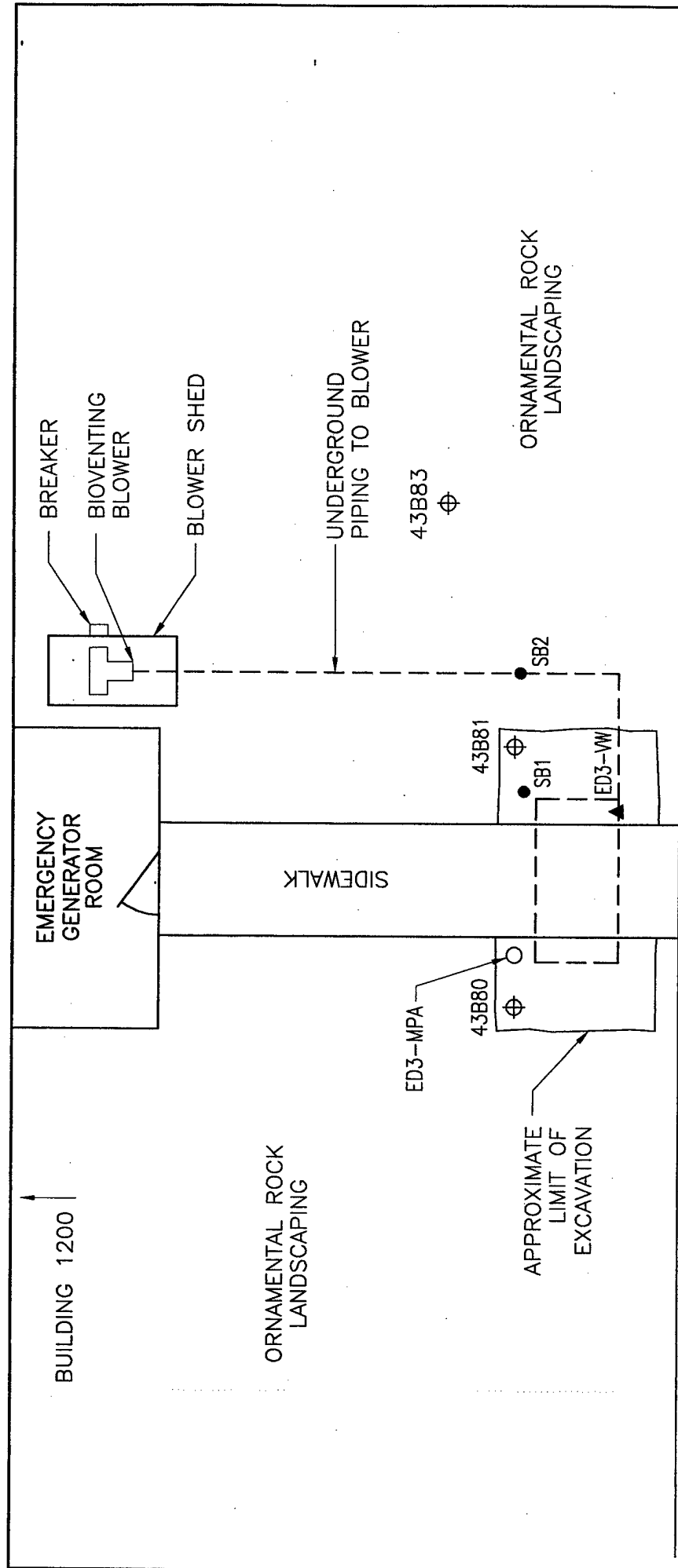
2.2 SITE GEOLOGY

Soils encountered during bioventing system installation (Parsons ES, 1994) included sand from ground surface to 5 to 7 feet below ground surface (bgs) followed by silty sand from the bottom of the sand to 15 feet bgs. Weathered granite bedrock was not encountered but is anticipated at approximately 30 feet bgs at IRP Site 43. During the most recent field investigation (December 1995), the depth to groundwater was measured at 34.2 feet bgs in well 43-MW-47. This well is located approximately 55 feet southeast of the site.

2.3 PREVIOUS SITE INVESTIGATIONS

As described in the closure SAP (see Appendix A), site contamination has been under review since 1991. During UST removal activities, two soil samples were collected from boreholes 43B80 and 43B81 at approximately 2 and 6 feet below the former tank bed bottom [The Earth Technology Corporation (Earth Tech), 1991]. Concentrations of total extractable hydrocarbons (TEH) ranging from 277.8 to 22,620 milligrams per kilogram (mg/kg) for analytical method SW8015 modified, were found in both soil samples. Under the direction of Earth Tech (1992), additional boreholes (43B82, 43B83, and 43B47) were drilled outside the tank bed and sampled in November 1992. The boreholes were sampled at varying subsurface intervals to a maximum depth of 30 feet bgs. Three samples from each borehole were analyzed for diesel-range organics, JP-4 jet fuel, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). All results for samples from these boreholes were non-detect at the method reporting limits, indicating soil contamination was restricted to the former UST bed.

A groundwater monitoring well was installed in borehole 43B47 and designated as 43MW47. This monitoring well was then added to the Operable Unit No. 1 groundwater sampling plan.



43B47
APPROXIMATE
25 FEET
SOUTH EAST

43B82

PAVED



5'
SCALE

LEGEND

- FORMER 165-GAL. DIESEL UST
- PREVIOUS SOIL BOREHOLE
- VENT WELL
- MONITORING POINT
- SOIL BOREHOLE

FIGURE 2.1

IRP SITE 43 BUILDING 1200
PREVIOUS BOREHOLE
AND BIOVENTING SYSTEM LOCATION
EDWARDS AFB, CALIFORNIA

PARSONS ENGINEERING SCIENCE, INC.

Based on the results of the 1991 and 1992 site investigations, bioventing pilot testing activities were conducted in the source area by Parsons ES, with long-term air injection beginning in September 1993. Pilot test activities are described in the Bioventing Pilot Test Interim Results Report (Parsons ES, 1994) and the closure SAP (see Appendix A). Highlights of the pilot test are as follow:

1. As part of the pilot test, one vent well (ED3-VW) for injection of air into the subsurface and one soil gas monitoring point (ED3-MPA) were installed in the former tank bed. Vent well (VW) and monitoring point (MP) locations are shown on Figure 2.1.
2. While attempting to locate the VW and MP in contaminated soil, boreholes SB1 and SB2 were drilled. However, there was no field evidence of contamination at these locations, and the two boreholes were backfilled with bentonite. These borehole locations are shown on Figure 2.1.
3. Initial testing indicated the extent of fuel contamination is limited to within a radius of approximately 3 to 5 feet from the VW and extends to at least 15 feet bgs.
4. Year-end sampling completed in November, 1994 indicated a 99.5- to 99.8-percent reduction in total volatile hydrocarbons (TVH) in the soil gas sample and total recoverable petroleum hydrocarbon (TRPH) reductions of 84.6 percent and 96.1 percent in two of the three soil samples. Initial respiration testing in the soils beneath the tank bed indicated a hydrocarbon biodegradation rate of approximately 150 milligrams of hydrocarbons per kilogram of soil per year (mg/kg/yr) (Parsons ES, 1994). The year-end respiration test indicated a hydrocarbon biodegradation rate of approximately 170 mg/kg/year.

SECTION 3

SITE CLOSURE SAMPLING AND ANALYSIS ACTIVITIES

The purpose of this section is to describe site closure and sampling activities, including borehole locations and sampling depths, soil sampling procedures, analytical methods used, and QA/quality control (QC) procedures followed. These methods/procedures are described in the closure SAP for IRP Site 43 (see Appendix A). The closure SAP was implemented under the direct supervision of a California Registered Geologist, as required by the California Regional Water Quality Control Board (RWQCB, 1995) *Interim Site Assessment and Clean-up Guidebook*.

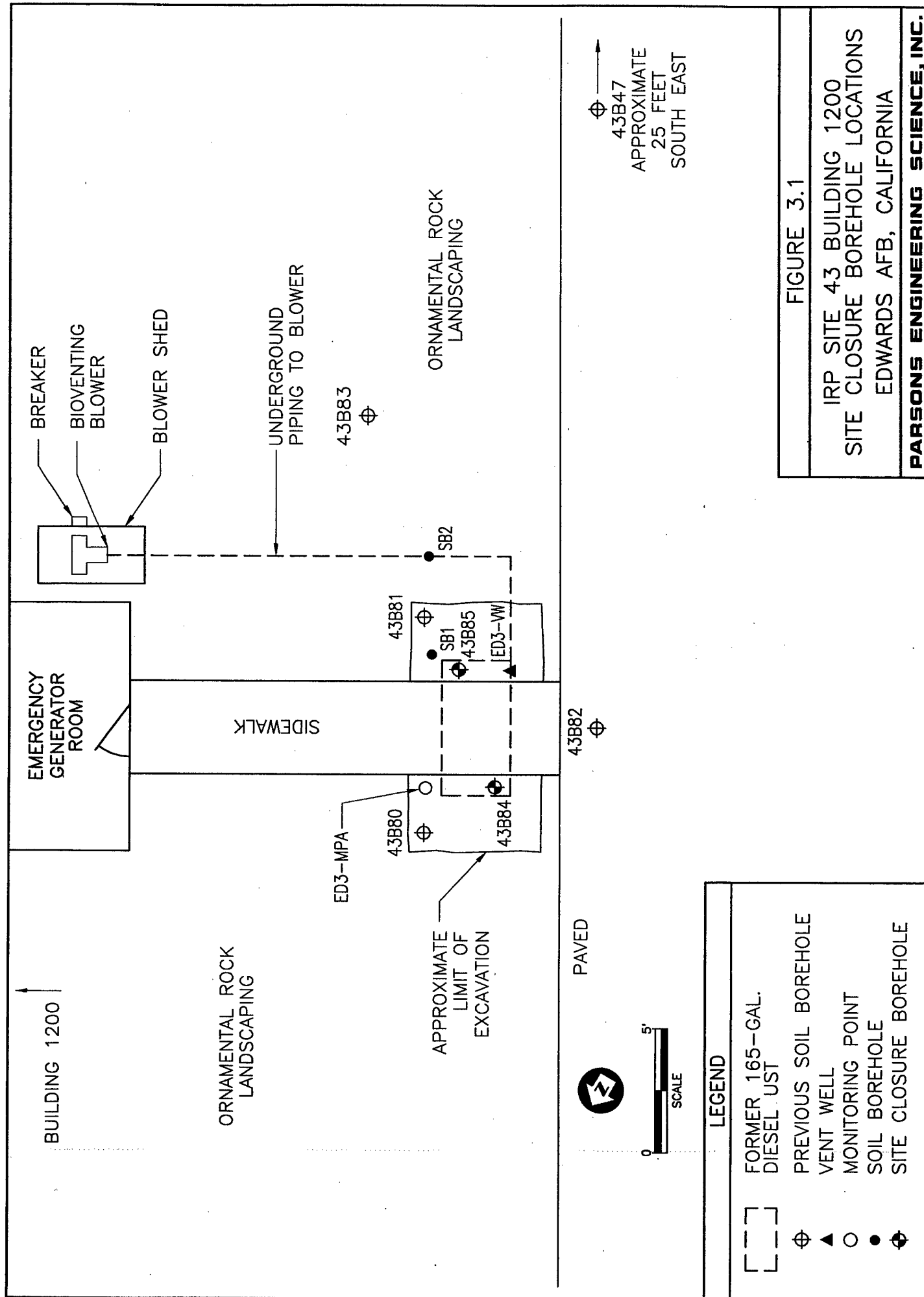
3.1 SITE CLOSURE BOREHOLE LOCATIONS AND SAMPLING DEPTHS

Closure soil sampling was conducted at the site on December 15, 1995. To confirm that site contamination has been remediated to within acceptable levels, Parsons ES drilled and sampled two additional boreholes (43B84 and 43B85), both situated within the former tank bed (as recommended by Kern County). Borehole locations are shown on Figure 3.1. Samples for chemical analysis were collected at 5-foot intervals, beginning at 5 feet bgs. Sampling continued at 5-foot intervals to a depth of 25 feet bgs, which is 10 feet deeper than the previous deepest contaminated sample. There was no field evidence of contamination [i.e., soil with above-background photoionization detector (PID) headspace readings, petroleum odor, or discoloration] in any of the samples collected.

3.2 DRILLING, SAMPLING, AND EQUIPMENT DECONTAMINATION

Boreholes were advanced using a drill rig equipped with 6-inch outside-diameter (OD) hollow-stem augers. Soil cuttings generated during drilling were placed in US Department of Transportation (DOT)-approved 55-gallon drums. The drums were labeled with the site name, drilling date, borehole number, depth intervals, and Edwards AFB point-of-contact. Drums were sealed and transported by Base personnel to a storage area as directed by the Base point-of-contact.

Boreholes were logged by a Parsons ES geologist registered in the State of California. Soil types were classified according to the Unified Soil Classification System (USCS) and described in accordance with the standard Parsons ES soil description format. These geologic borehole logs are presented in Appendix B.



Before use and between boreholes, augers and other downhole equipment were cleaned to avoid cross-contamination. Cleaning was accomplished using a high-pressure hot-water wash, followed by a potable water rinse. Decontamination fluids were collected and contained in a labeled 55-gallon drum.

Relatively undisturbed soil samples, suitable for chemical analysis, were collected at approximately 5-foot intervals. Soil samples were collected in a 2.5-inch inside-diameter (ID) split-barrel sampler that was lowered through the hollow stem of the augers and driven approximately 1.5 feet into undisturbed soil, ahead of the augers. Between sampling events, the split-barrel sampler was cleaned with Alconox® detergent, followed by successive potable and distilled water rinses.

The split-barrel sampler was fitted with three precleaned, 2.5-inch-OD by 6-inch-long, thin-walled, brass sleeves. Before samples were collected, sample sleeves were cleaned using the same procedure as that for the sampler. After collection of a sample, the sampler was retrieved, split apart, and the sleeves were removed. The ends of the lowest sleeves that contain the samples for chemical analyses were covered with Teflon® sheets and plastic end caps.

Samples in the upper sample sleeves were used for logging purposes, and were screened in the field for organic vapors using a PID. The data obtained from the logging and screening were recorded on the borehole logs (Appendix B).

The sleeves for chemical analysis were labeled with the site name and borehole number, sample depth, date of collection, and other pertinent data. These sleeves were immediately sealed in plastic bags and placed in an insulated shipping container with ice. The samples were maintained in a chilled condition until delivered to Quanterra Environmental Services, a California state-certified laboratory located in Santa Ana, California. Chain-of-custody records were prepared in the field in accordance with the SAP, and accompanied the samples to the analytical laboratory.

After sampling, boreholes were backfilled with bentonite chips (hole plug) to approximately 1 foot bgs. The bentonite was hydrated during placement at a rate of 2 to 5 gallons of water per 50-pound bag of chips. A concrete cap approximately 1 foot thick was placed on top of the bentonite.

The VW and MP at the site were left undisturbed and the blower system was restarted after the above-described site activities were completed. Should site closure be granted, Edwards AFB should make arrangements for the VW and MP to be properly abandoned (abandonment is not currently included in the Parsons ES scope of work).

3.3 FIELD AND LABORATORY DATA QUALITY ASSURANCE/ QUALITY CONTROL

Four QA/QC samples were collected during field activities. The samples included a field duplicate, an equipment rinseate blank, and a trip blank. Also, additional sampling volume was submitted in order for the laboratory to run matrix spike/matrix spike duplicate (MS/MSD) analyses.

3.4 SOIL SAMPLE ANALYSIS

All samples were analyzed by Quanterra Environmental Services, a State of California-certified and AFCEE-approved laboratory. The sample analytical methods and practical quantitation limits (PQLs) used during this effort are presented in Table 3.1. All soil samples were analyzed by US Environmental Protection Agency (USEPA) Method SW8015 modified for total petroleum hydrocarbons (TPH) as diesel fuel, USEPA Method SW8015 modified for TPH as gasoline, and by USEPA Method SW8020 for benzene, toluene, ethylbenzene, and total xylenes (BTEX).

TABLE 3.1
SOIL SAMPLE ANALYTICAL METHODS AND
PRACTICAL QUANTITATION LIMITS
IRP SITE 43 CLOSURE
EDWARDS AFB, CALIFORNIA

Analytical Method	PQL (mg/kg) ^{a/}
USEPA SW8015 Modified for Diesel (California Department of Health Services Method)	11.0
USEPA SW8015 Modified for Gasoline (California Department of Health Services Method)	1.1
USEPA SW8020	
Benzene	0.001
Toluene	0.005
Ethylbenzene	0.005
Xylenes	0.005

^{a/} PQL = practical quantitation limit; mg/kg = milligrams per kilogram

3.5 DATA VALIDATION

Laboratory data were subjected to the data validation process described below. Based on this process, data used to support a closure recommendation are considered valid.

3.5.1 Chain-of-Custody Check

times, and dates were present and legible. Dates and sample numbers were consistent with project analytical reports. For the trip blank, the requested analysis method was inadvertently omitted from the chain-of-custody form. The laboratory was subsequently contacted to correct this omission.

3.5.2 Holding Time Check

The sample holding time is the method-specified time allowable from sample collection to sample preparation, extraction, or analysis. All sample analyses should be conducted within the holding time specific to each analytical method. Holding times for all samples were determined from documented laboratory preparation/analysis dates and compared with the sampling dates on the chain-of-custody forms. All of the results on the laboratory summary forms were checked to ensure that the reported analyses were conducted within the specified holding times. No holding times were exceeded for any of the closure samples.

3.5.3 Analytical Report Review

Laboratory reports were provided for environmental samples, the trip blank, laboratory control samples, and laboratory control sample duplicates. The reports were checked for the following information:

1. Name of laboratory and address.
2. Name of client.
3. Analytical method used (title and method number).
4. Sample identification (client and laboratory numbers)
5. Dates samples were received, extracted/digested, analyzed, and reported.
6. Sample matrix.
7. Parameters tested.
8. Agreement with chain-of-custody.
9. Reporting units.
10. Concentration of each parameter detected.
11. Reporting limit for each parameter in each method.
12. Dilution factor.
13. Signature of laboratory supervisor or director.

The analytical report narrative must specify any modifications to the analytical methods performed as well as any unusual situations or problems encountered during analysis or shipment (e.g., exceeded holding times, breakdown in procedures, interferences, blank contamination). It should also include a summary of any corrective actions taken. The report should include an explanation of terminology, acronyms, and special notations used in the report. The analytical reports were complete and no unusual circumstances were noted.

3.5.4 Review of Quality Control Samples

The analysis of blank sample results is performed to determine the existence and magnitude of contamination problems. No contaminants should be present in the blanks. If contamination exists in any blank sample, the data associated with the blank must be

carefully evaluated to determine whether or not inherent variability of the data exists, or if the problem is an isolated occurrence not affecting other data. All of the results on the laboratory summary forms were reviewed to ensure that reported results met required QC criteria.

3.5.4.1 Field Duplicate

Duplicate samples are a measure of precision. Relative percent differences between analyzed concentrations of samples taken in duplicate in the field should fall within acceptable limits for those analyses. A field duplicate of the soil matrix was collected at borehole 43B85 from 4.0 to 4.5 feet bgs. This duplicate was labeled 43B86 4.5-5.0, and was included with the other samples sent to the laboratory. As with all the other samples tested, results for the field duplicate analyses were nondetect.

3.5.4.2 Trip Blanks

Trip blanks are indicators of possible sample exposure to contamination during shipping. They are prepared using reagent-grade water and accompany soil samples designed for volatiles analysis in the shipping container from the sampling location to the laboratory. Contamination was not detected in the trip blank associated with the sampling event. The laboratory indicated that the trip blank met QC criteria.

3.5.4.3 Rinseate Blanks

Rinseate blanks are prepared by collecting distilled water that is poured through a decontaminated split-barrel sampler. This serves as an equipment decontamination check. Contamination was not detected in the rinseate blank associated with the sampling event. The laboratory indicated that the rinseate blank met QC criteria.

3.5.5 Matrix Spike/Matrix Spike Duplicate Analysis

The MS/MSD data are generated to determine long-term precision and accuracy of the analytical method with respect to the various matrices subject to analysis. The percent recovery of a spike was calculated by the laboratory and compared to an acceptable range specific to each method. The precision of each method was assessed by calculating the relative percent difference (RPD) from the MS/MSD pair analysis, and comparing the value to an acceptable range established for each method. All of the results reported on the laboratory data summary forms were reviewed to ensure that reported results met required QC criteria. The laboratory reported that all surrogate spike percent-recovery and RPD data met QC criteria.

SECTION 4

CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the analytical results from the field sampling conducted pursuant to closure of IRP Site 43 at Edwards AFB. Based on earlier site investigations and bioventing pilot testing, and on the results of the closure sample analyses, conclusions regarding remediation of fuel contaminants in vadose zone soils are summarized, and recommendations for Site 43 are presented.

4.1 LABORATORY RESULTS

Complete laboratory analytical results from Quanterra Environmental Services are presented in Appendix C. These results are summarized in Table 4.1. All of the laboratory results, including the field, rinseate, and trip blanks, were nondetect for all analytical methods used.

4.2 CONCLUSIONS

There was no field evidence of fuel hydrocarbon contamination (i.e., soil with above-background PID readings, petroleum odor, or discoloration) in any of the samples collected. All of the laboratory analytical results, including those for QC samples, were below reporting limits for all analytical methods. These results are in conformity with quantitative site cleanup goals established by the California RWQCB (1995) and adopted by Kern County. The results indicate that site vadose zone soils have been fully remediated for the target compounds during the period of operation of the pilot-scale bioventing system. Based on the depth to groundwater (34.2 feet bgs) at this site, the California RWQCB Level A MCLs apply and these cleanup goals are listed in Table 1.1.

4.3 RECOMMENDATIONS

Given the site closure soil sample analytical results summarized in Table 4.1, site closure and no further remedial action at the site is recommended.

This site meets all applicable state cleanup goals, and it is requested that Kern County approve closure of IRP Site 43. Once closure has been granted, it is recommended that the bioventing system be shut down, and that Edwards AFB make arrangements for the VW and MP to be properly abandoned by drilling them out and backfilling the boreholes with bentonite chips. The bioventing blower system and shed should be dismantled and removed from the site. The underground air injection piping should be capped at both ends and properly abandoned in place.

TABLE 4.1
SOIL ANALYTICAL RESULTS DECEMBER 1995
IRP SITE 43 BUILDING 1200 FORMER DIESEL UST SITE
EDWARDS AFB, CALIFORNIA

Borehole ID	Sample Depth (feet bgs) ^a	Matrix	Analytical Method					
			USEPA Method SW8015 M		USEPA Method SW8020			
			Mod. Diesel (mg/kg) ^b	Mod. Gasoline (mg/kg)	Benzene (µg/kg) ^c	Toluene (µg/kg)	Ethylbenzene (µg/kg)	Xylenes (µg/kg)
43B84	5	Soil	<1 ^d	<1.1	<1.1	<5.6	<5.6	<5.6
43B84	10	Soil	<10	<1	<1.0	<5.1	<5.1	<5.1
43B84	15	Soil	<11	<1.1	<1.1	<5.4	<5.4	<5.4
43B84	20	Soil	<11	<1.1	<1.1	<5.5	<5.5	<5.5
43B84	25	Soil	<11	<1.1	<1.1	<5.4	<5.4	<5.4
43B85 ^e	5	Soil	<11	<1.1	<1.1	<5.3	<5.3	<5.3
43B85	15	Soil	<11	<1.1	<1.1	<5.4	<5.4	<5.4
43B85	20	Soil	<11	<1.1	<1.1	<5.3	<5.3	<5.3
43B85	25	Soil	<11	<1.1	<1.1	<5.4	<5.4	<5.4
43B86 ^f	5	Soil	<10	<1.0	<1.0	<5.2	<5.2	<5.2
Trip Blank	NA	Water	(mg/L) ^g	(mg/L)	(µg/L) ^h	(µg/L)	(µg/L)	(µg/L)
Rinseate Blank	NA	Water	-- ⁱ	<0.10	<0.50	<1.0	<1.0	<1.0
			<1	<0.10	<0.50	<1.0	<1.0	<1.0

^a feet bgs = feet below ground surface

^b mg/kg = milligrams per kilogram

^c µg/kg = micrograms per kilogram

^d Analyte not detected at the reporting limit.

^e Matrix spike/Matrix spike duplicate (MS/MSD) run on this sample.

^f Duplicate of 43B85-5-foot-depth sample.

^g mg/L = milligrams per liter.

^h µg/L = micrograms per liter.

ⁱ -- = Not analyzed

SECTION 5

REFERENCES

- California Regional Water Quality Control Board, Los Angeles Region (RWQCB). 1995. *Interim Site Assessment and Clean-up Guidebook*. Vol I. February.
- Earth Technology Corporation. 1991. *Underground Tank Removal Soil Sampling Report Field Note Worksheet and Soil Sample Analysis Table*.
- Earth Technology Corporation. 1992. *Analytical Results for Selected Boreholes in Site 43*.
- Parsons Engineering Science, Inc. 1994. *Draft Bioventing Pilot Test Interim Results Report for IRP Site 43 Building 1200 Former Diesel UST*. Prepared for Air Force Center for Environmental Excellence. January.
- Parsons Engineering Science, Inc. 1995. *Closure Sampling and Analysis Plan for IRP Site 43, Building 1200 Former Diesel UST Site. Edwards AFB, California*. Prepared for Air Force Center for Environmental Excellence Texas, and Edwards AFB, California. September.

APPENDIX A
CLOSURE SAMPLING AND ANALYSIS PLAN FOR IRP SITE 43
BUILDING 1200 FORMER UST SITE
EDWARDS AFB, CALIFORNIA

Closure Sampling and Analysis Plan

for

IRP Site 43 Building 1200 Former Diesel UST Site

Edwards AFB, California

Prepared For

**Air Force Center for Environmental Excellence
Brooks AFB, Texas**

and

Edwards AFB, California

Parsons Engineering Science, Inc.

SEPTEMBER 1995

9404 Genesee Avenue, Suite 140
La Jolla, California 92037

**Closure Sampling and Analysis Plan
for
IRP Site 43 Building 1200 Former Diesel UST Site
Edwards AFB, California**

Prepared for:

**Air Force Center for Environmental Excellence
Brooks AFB, Texas
and
Edwards AFB, California**

September 1995

**Parsons Engineering Science, Inc.
9404 Genesee Avenue, Suite 140
La Jolla, California 92037**

CONTENTS

	Page
1 INTRODUCTION.....	1-1
2 SITE DESCRIPTION AND HISTORY	2-1
2.1 Site Description.....	2-1
2.2 Site Geology	2-1
2.3 Previous Investigations.....	2-1
2.3.1 UST Removal	2-1
2.3.2 Soil Investigation 1992.....	2-3
2.3.3 Bioventing: 1993-1994.....	2-3
3 SITE CLOSURE REQUIREMENTS	3-1
3.1 Site Soil Cleanup Standards.....	3-1
4 SITE CLOSURE SAMPLING AND ANALYSIS PLAN	4-1
4.1 Site Closure Borehole Locations and Sampling Depths	4-1
4.2 Drilling, Sampling, and Equipment Decontamination.....	4-1
4.3 Soil Sample Analysis	4-4
5 SITE CLOSURE REPORT FORMAT	5-1
6 REFERENCES	6-1

FIGURES

Figure	Description	Page
2.1	IRP Site 43 Building 1200 Former Diesel UST Site Layout	2-2
2.2	IRP Site 43 Building 1200 Bioventing System Location	2-5
2.3	IRP Site 43 Building 1200 Geologic Cross Section A-A'	2-6
4.1	IRP Site 43 Building 1200 Proposed Site Closure Borehole Locations	4-2

TABLES

Table	Description	Page
2.1	Tank Bed Bottom Soil Analytical Results IRP Site 43, Building 1200 Former Diesel UST Site Edwards AFB, California	2-3
2.2	Soil Analytical Results, November 1992 IRP Site 43, Building 1200 Former Diesel UST Site Edwards AFB, California	2-4
2.3	Initial and 1-Year Soil and Soil Gas Analytical Results IRP Site 43 Building 1200 Former Diesel UST Site	2-7
3.1	California Regional Water Quality Control Board Soil Cleanup Standards	3-2
4.1	Proposed Soil Sample Analytical Methods and Practical Quantitation Limits	4-4

SECTION 1

INTRODUCTION

During the past two years, Edwards Air Force Base (AFB) has participated in the Air Force Bioventing Pilot Test Initiative Project. Sponsored by the Air Force Center for Environmental Excellence (AFCEE) at Brooks AFB, Texas, the project included conducting more than 135 *in situ* bioventing pilot tests at 48 Air Force installations throughout the country. These tests were designed to collect data on the effectiveness of bioventing for the remediation of soil contaminated with fuel hydrocarbons (i.e., JP-4 jet fuel, diesel fuel, gasoline, heating oil, etc.). One-year-long bioventing pilot tests have recently been concluded at three Edwards AFB sites. Based on the results of these one-year tests, *in situ* bioventing has been effective enough to support closure of the IRP Site 43 Building 1200 Former Diesel underground storage tank (UST) Site.

This Site Closure Sampling and Analysis Plan (SAP) has been prepared by Parsons Engineering Science, Inc. (Parsons ES) for submittal to the Kern County Environmental Health Services Department (Kern County). This SAP presents a plan for confirmation soil sampling and analysis to document the effectiveness of soil remediation at this site and to demonstrate compliance with regulatory requirements for closure. It is anticipated that analytical results will support a no-further-action recommendation, and that Kern County will grant site closure.

This SAP consists of six sections, including this introduction. Section 2 includes site descriptions, histories, and summaries of previous investigations and remediation activities. Section 3 summarizes all applicable site closure requirements. A detailed site closure SAP is presented in Section 4. Analytical results will be presented in a site closure report as described in Section 5. Section 6 provides references cited in this SAP.

SECTION 2

SITE DESCRIPTION AND HISTORY

2.1 SITE DESCRIPTION

Building 1200 is located between Wolfe Avenue to the northwest and the main taxi way to the southeast (Figure 2.1). Building 1200 houses the flightline manager operations facility. The former underground storage tank (UST) area is located to the west of Building 1200, within IRP Site 43. The former 165-gallon diesel UST was used to store fuel for an emergency generator located adjacent to Building 1200. The former diesel tank location, with respect to Building 1200, is shown on Figure 2.1.

Site information provided by Edwards AFB was limited to results of soil samples collected during tank removal. The information did not include: (1) tank removal date; (2) the nature of backfill and native material; (3) the extent of contamination left in place; and (4) the soil boring logs and analytical results from site investigation borings for a nearby groundwater monitoring well.

2.2 SITE GEOLOGY

Soils encountered during bioventing system installation (Parsons ES, 1994) included sand from ground surface to 5 to 7 feet bgs followed by silty sand from the bottom of the sand to 15 feet bgs. Weathered granite bedrock was not encountered but is anticipated at approximately 20 to 35 feet bgs at Site 43. In January 1995, the depth to groundwater was measured at 31.5 feet bgs in well 43-MW-47. The well is located approximately 55 feet southeast of the site.

2.3 PREVIOUS INVESTIGATIONS

2.3.1 UST Removal

As previously mentioned, the exact tank removal date is unknown. However, during tank removal activities, two soil samples were collected at approximately two and six feet below the former tank bed bottom. The hydrocarbon concentrations detected are shown in Table 2.1 (Earth Tech, 1991).

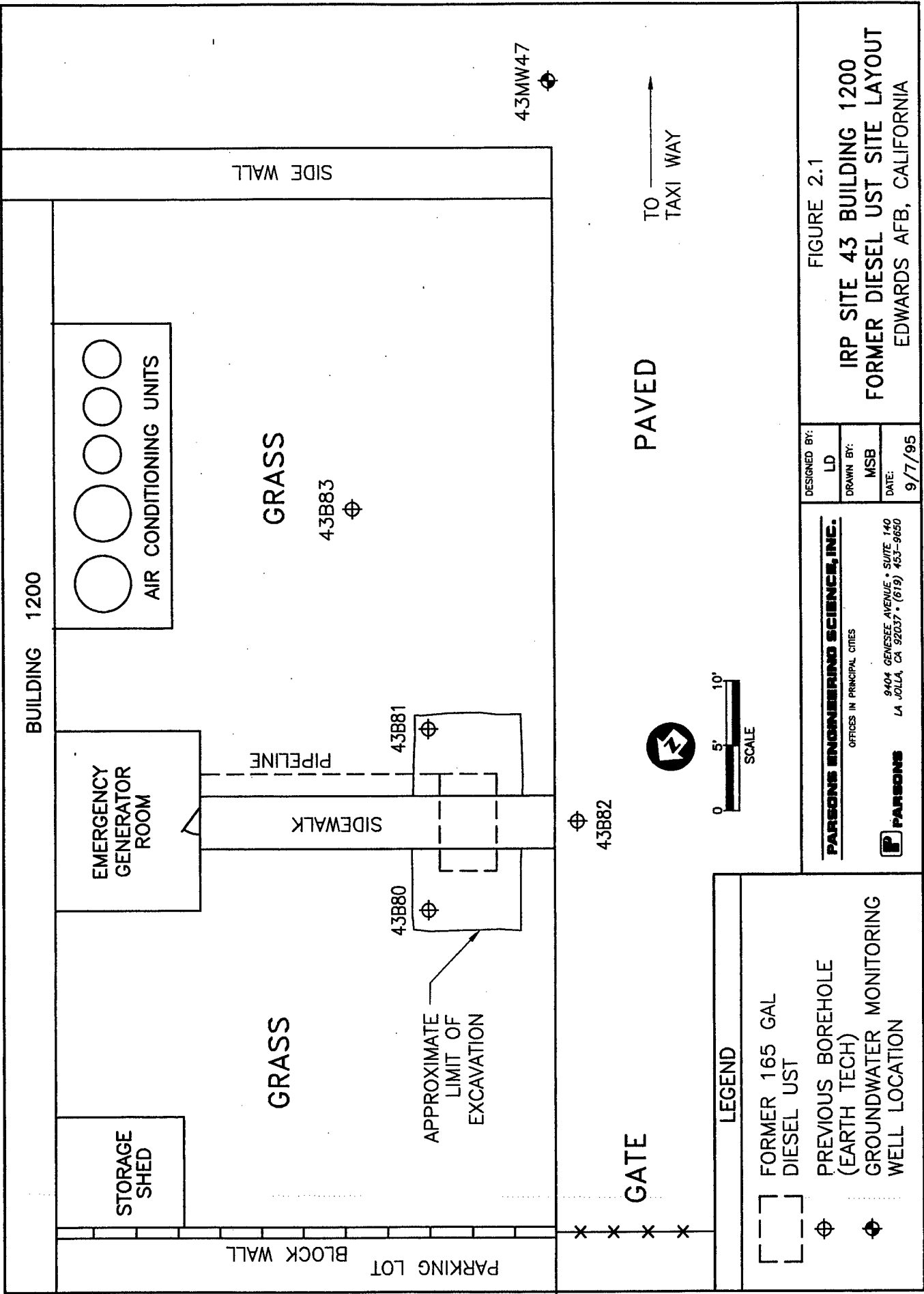


Table 2.1

**Tank Bed Bottom Soil Analytical Results
IRP Site 43, Building 1200 Former Diesel UST Site
Edwards AFB, California**

Sample No.	Depth (feet bgs)	EPA 8015 Mod. Diesel (mg/kg)	EPA 602 in (mg/kg)			
			Benzene	Toluene	Ethyl Benzene	Xylenes
S1	6.0	22,620	ND	1.19	3,333	20.6
S2	10.8	277.8	ND	ND	ND	ND

2.3.2 Soil Investigation 1992

In November 1992, several soil boreholes were drilled and sampled by Earth Tech, and a groundwater monitoring well was installed in one borehole. The borehole and well locations are shown on Figure 2.1. Three samples were collected from each borehole. Samples were analyzed by EPA Method 8015 Modified for diesel and JP4, Method 8240 for volatile organic compounds and Method SW 8270 for semi-volatile organic compounds. All results were non-detect at the method reporting limit as summarized in Table 2.2 (Earth Tech, 1992).

2.3.3 Bioventing: 1993-1994

Bioventing pilot testing activities were conducted by Parsons ES beginning in September 1993. As part of the pilot test, one vent well (VW) for injection of air into the subsurface and one soil gas monitoring point (MP) were installed at the site. Two other borings, SB1 and SB2, were drilled at the site. Because these borings had no field evidence of contamination, they were backfilled with bentonite. No samples were collected from these two borings. VW and MP locations are shown on Figure 2.2 and in cross section on Figure 2.3. Because the project focus was on bioventing rather than site characterization, only limited sampling was performed. Three soil and two soil gas samples were collected from the VW and MP. Analytical results are presented in Table 2.3. Detailed pilot testing procedures and results are presented in the bioventing report (Parsons ES, 1994).

Initial testing indicated the extent of contamination is limited to approximately 3 to 5 feet from the VW and extends to at least 15 feet bgs. MPA, located 7 feet from the VW, had no field or laboratory evidence of contamination. Because MPA had no

Table 2.2

Soil Analytical Results, November 1992
IRP Site 43, Building 1200 Former Diesel UST Site
Edwards AFB, California

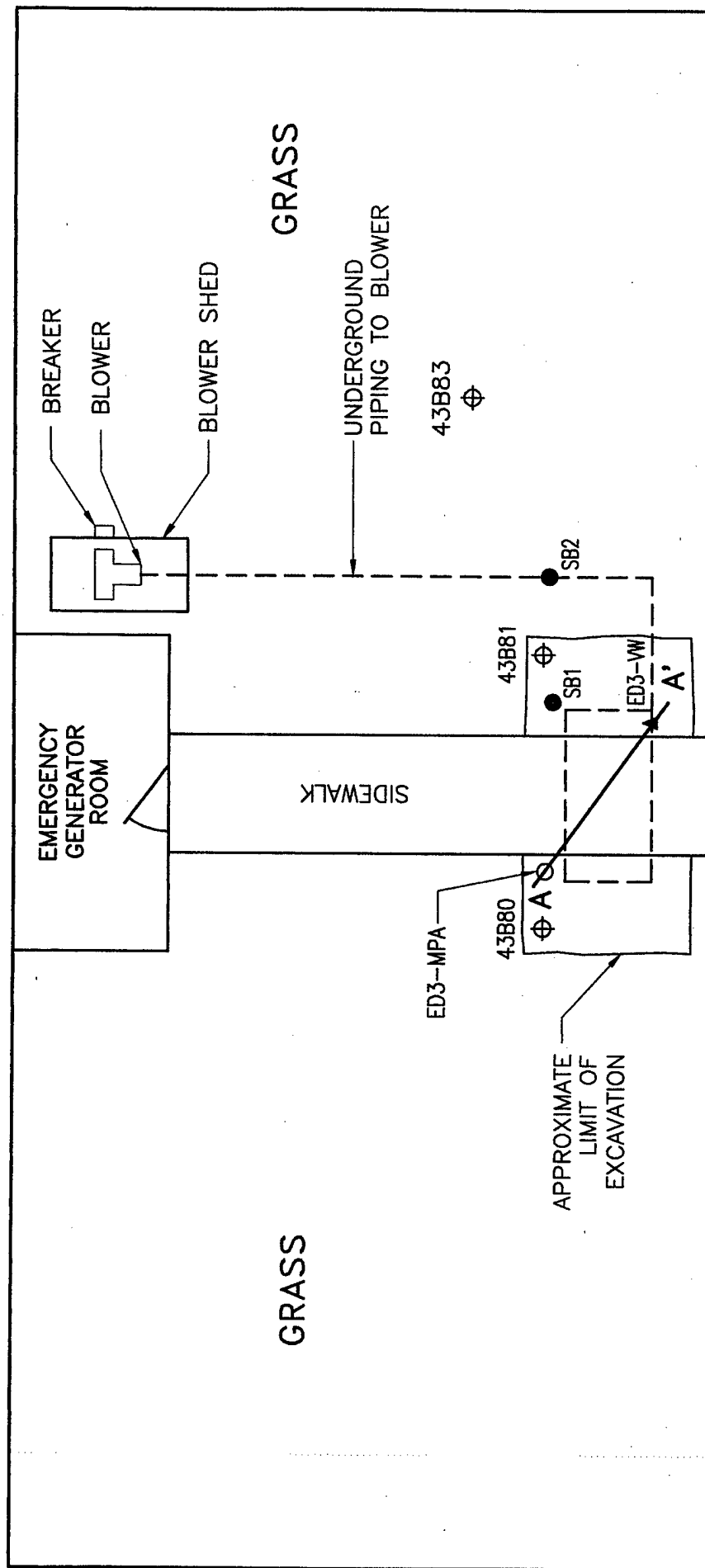
Borehole I.D.	Sample Depth (feet bgs)	EPA 8015 Mod. Diesel (mg/kg)	EPA 8015 Mod. JP4 (mg/kg)	SW 8240 (mg/kg)	SW 8270 (mg/kg)
43B80	10	ND	ND	ND	--
43B80	15	ND	ND	ND	ND
43B80	30	ND	ND	ND	ND
43B81	0	ND	ND	ND	--
43B81	10	ND	ND	ND	ND
43B81	15	ND	ND	ND	ND
43B82	5	ND	ND	ND	ND
43B82	20	ND	ND	ND	--
43B82	30	ND	ND	ND	ND
43B83	5	ND	ND	ND	ND
43B83	15	ND	ND	ND	ND
43B83	25	ND	ND	ND	--

ND = Non-detect at method reporting limit.

-- = Not analyzed.

evidence of contamination, a respiration test was conducted in the VW. The test indicated a hydrocarbon reduction rate of approximately 150 mg of hydrocarbons per kg of soil per year. This low rate was most likely the result of vent well dilution (i.e., oxygen from non-contaminated zones entering the vent well thereby masking the oxygen utilization rate of the contaminated zone).

Long-term air injection at the IRP Site 43 former diesel UST site began in September 1993. Year-end sampling completed in November 1994 indicated a 99.5 to 99.8 percent reduction in TVH in the soil gas sample and TRPH reductions of 84.6 percent and 96.1 percent in two of the three soil samples (Table 2.3). The year-end respiration test indicated a hydrocarbon biodegradation rate of approximately 170 mg/kg per year. Following year-end testing, the blower was restarted and is currently injecting



PAVED

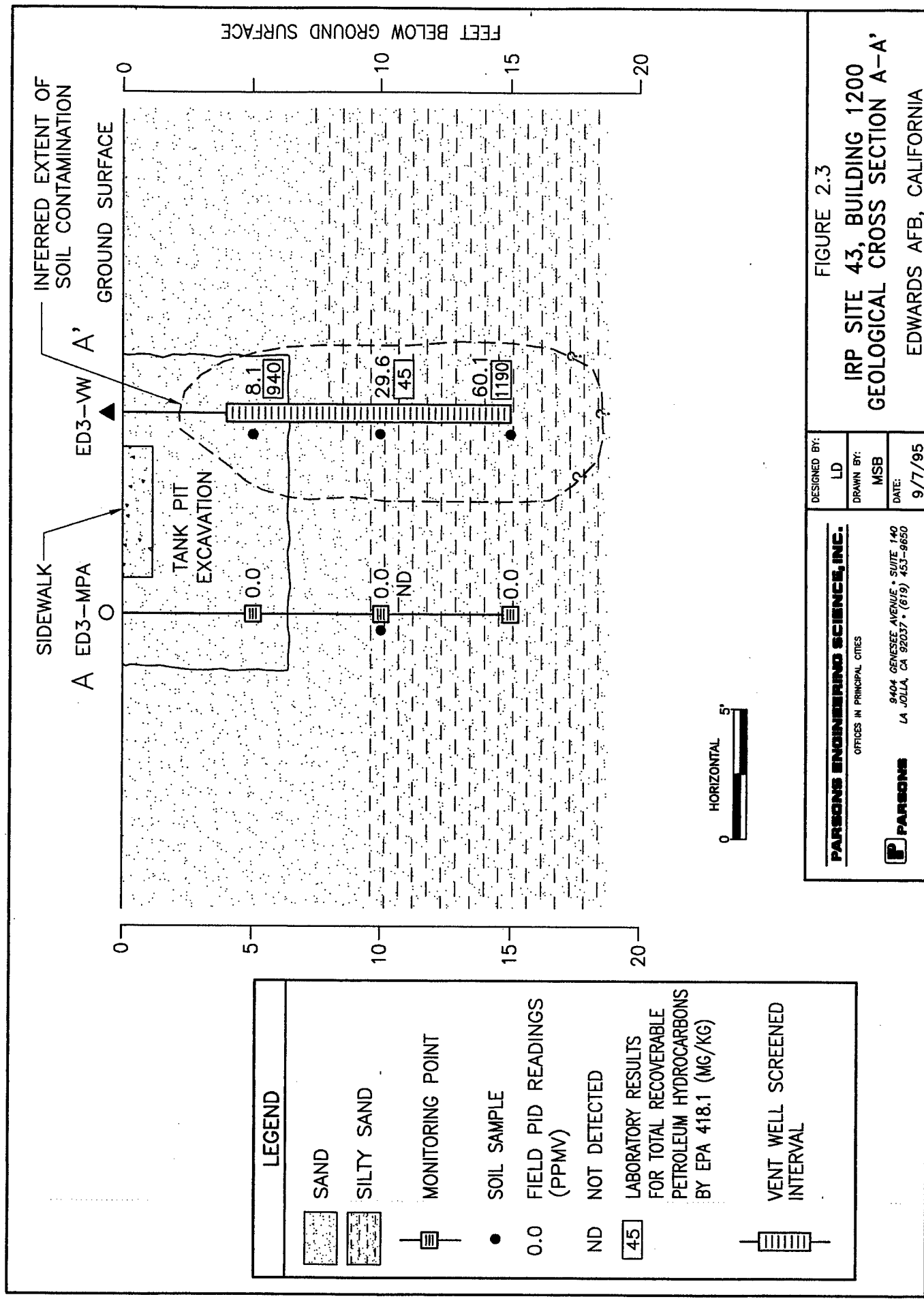
LEGEND

- FORMER 165 GAL DIESEL UST
- PREVIOUS BOREHOLE (EARTH TECH)
- VENT WELL
- MONITORING POINT
- BOREHOLE
- GEOLOGICAL CROSS SECTION LOCATION

DESIGNED BY: LD
DRAWN BY: MSB
DATE: 9/7/95

PARSONS ENGINEERING SCIENCE, INC.
OFFICES IN PRINCIPAL CITIES
9404 GENESEE AVENUE • SUITE 140
LA JOLLA, CA 92037 • (619) 453-9650

FIGURE 2.2
IRP SITE 43 BUILDING 1200
BIOVENTING SYSTEM LOCATION
EDWARDS AFB, CALIFORNIA



DESIGNED BY: LD
 DRAWN BY: MSB
 DATE: 9/7/95

PARSONS ENGINEERING SCIENCE, INC.
 OFFICES IN PRINCIPAL CITIES
 9404 GENESEE AVENUE • SUITE 140
 LA JOLLA, CA 92037 • (619) 453-8650

FIGURE 2.3
 IRP SITE 43, BUILDING 1200
 GEOLOGICAL CROSS SECTION A-A'
 EDWARDS AFB, CALIFORNIA

Table 2.3

**Initial and 1-Year Soil and Soil Gas Analytical Results
IRP Site 43 Building 1200 Former Diesel UST Site
Edwards AFB, California**

Analyte (units) ^{a/}	Sample Location-Depth (feet below ground surface)					
	VW		MPA-15		MPA-10	
<u>Soil Gas Hydrocarbons</u>	Initial ^{b/}	1-Year ^{c/}	Initial	1-Year	Initial	1-Year
TVH (ppmv)	690	1.5	76	0.40		
Benzene (ppmv)	<0.023	<0.002	<0.002	<0.002		
Toluene (ppmv)	<0.023	0.011	0.006	<0.002		
Ethylbenzene (ppmv)	0.18	0.022	<0.002	<0.002		
Xylenes (ppmv)	0.95	0.21	<0.002	<0.002		
	VW-5		VW-10		VW-15	
<u>Soil Hydrocarbons</u>	Initial ^{d/}	1-Year ^{e/}	Initial	1-Year	Initial	1-Year
TRPH (mg/kg)	940	37.3	45	71.1	1190	184
Benzene (mg/kg)	<0.29	<0.05	<0.0006	<0.05	<0.27	<0.05
Toluene (mg/kg)	<0.29	<0.05	<0.0006	<0.05	<0.27	<0.05
Ethylbenzene (mg/kg)	0.37	<0.05	<0.0006	<0.05	<0.27	<0.05
Xylenes (mg/kg)	1.6	<0.1	<0.0008	<0.1	1.1	<0.1
Moisture (%)	13	1.2	8.2	1.0	9	3.0
					7.4	1.4

^{a/} TVH = total volatile hydrocarbons; ppmv = parts per million, volume per volume;

TRPH = total recoverable petroleum hydrocarbons; mg/kg = milligrams per kilogram.

^{b/} Initial soil gas samples collected on 9/10/93 and 9/11/93.

^{c/} 1-Year soil gas samples collected on 11/1/94.

^{d/} Initial soil samples collected on 9/8/93.

^{e/} 1-Year soil samples collected on 11/4/94.

air into the VW. Based on the encouraging year-end sampling and testing results, it is anticipated that site TRPH concentrations are below 100 mg/kg, and the BTEX concentrations are below detection limits. It is also anticipated that results of sampling described in Section 4 will support site closure.

SECTION 3

SITE CLOSURE REQUIREMENTS

Site specific closure requirements were described by Mr. Wesley Nicks, a Kern County Regulator, to Mr. Larry Dudus (Parsons ES) in a 22 August 1995 telephone conversation. Mr. Nicks has requested two additional soil boreholes be drilled and sampled at the site adjacent to the vent well. Both borings are to be located in the former tank bed, with one adjacent to the vent well. Samples are to be collected at 5-foot intervals until two consecutive samples with no field detectable contamination are encountered. A detailed sampling and analysis plan is presented in Section 4.

3.1 SITE SOIL CLEANUP STANDARDS

In February 1995 the California Regional Water Quality Control Board (RWQCB), Los Angeles Region, released its Interim Site Assessment and Cleanup Guidebook. Site cleanup guidance is included in Volume I of the guidebook. The guidebook sets specific numerical cleanup goals based on type of contaminant, depth to groundwater and potential use of groundwater (i.e., drinking water).

Kern County generally follows the recommendations presented in the guidebook. Soil cleanup standards for petroleum-impacted sites are presented in Section 5 of the guidebook and in Table 3.1. Depth to groundwater at the site is approximately 32 feet below ground surface (bgs) and is considered to be drinking water by the California RWQCB. Therefore, Level A cleanup standards apply.

Table 3.1
California Regional Water Quality Control Board
Soil Cleanup Standards
(mg/kg or ppm)

	Distance Above Groundwater (ft)		
	<40	40-150	>150
ABOVE DRINKING WATER	LEVEL A	LEVEL B	LEVEL C
BTEX + FA	MCL	10 MCL	100 MCL
TPH (Carbon Range)			
C4 - C12	10	100	1000
C13 - C22	100	1000	10000
C23 +	1000	10000	10000
ABOVE NON-DRINKING WATER	LEVEL D		
	(FOR ANY DEPTH TO GROUNDWATER)		
BTEX + FA	100 MCL		
TPH (Carbon Range)			
C4 - C12	1000		
C13 - C22	10000		
C23 +	15000		

Source: RWQCB, 1995.

MCLS: B = 0.001 (ppm), T = 0.1 (ppm), E = 0.68 (ppm), X = 1.75 (ppm), Pb = 0.015 (ppm),
EDB + 0.02 (ppb),
PAH = 0.2 (ppb)

- MCL = Maximum contaminant levels.
- BTEX = Benzene, toluene, ethylbenzene, and xylenes, respectively.
- TPH = Total petroleum hydrocarbons.
- FA = Fuel additives, lead (Pb), ethylene dibromide (EDB), etc., including other components (i.e., PAH) of petroleum products which have MCLs.
- Use of this table assumes the original source has been removed and an adequate site assessment has been completed.
- For BTEX or FA, each component is not to exceed 1, 10, or 100 times its MCL as specified.
- For TPH, the total allowable for each range is not to be exceeded and the overall total is not to exceed the given value for the heavier TPH (C23+).
- Soil levels below the appropriate levels in this table require no action, soil levels above the appropriate levels in this table must be remediated to or below provided levels, or a site-specific analysis must be conducted, or justification provided to determine more appropriate levels for an individual site. Groundwater monitoring may be required if soil contamination linkage to groundwater impact has been confirmed.
- BTEX to be analyzed by EPA Method 8020, or EPA Method 8260 (usually to confirm positive benzene).
- TPH to be analyzed by EPA Methods 418.1 and 8015 (Modified). Ranges of TPH to be analyzed by GC/MS carbon range methods or EPA Method 8015 (DHS Modified). PAH to be analyzed by EPA Method 8310.
- Use of Non-Drinking Water Levels are dictated by either water characteristics as defined and exempted under SWRCB Resolution 88-63 (TDS > 3000 mg/L, deliverability < 200 gal/day, or existing contamination that cannot be reasonably treated), or as agreed upon by Regional Board staff for use at a particular site.
- Minimum clean interval below impacted area to be determined on a site-specific basis by Regional Board staff, generally 40' above drinking waters and 20' above non-drinking waters.

SECTION 4

SITE CLOSURE SAMPLING AND ANALYSIS PLAN

The following SAP describes the borehole locations and sampling depths, soil sampling procedures, and analytical methods proposed to collect sufficient data to support site closure. This plan has been prepared and will be implemented by, or under the direct supervision of, a California Registered Geologist as required by the California RWQCB (1995) Interim Site Assessment and Clean-up Guidebook (see Section 3).

4.1 SITE CLOSURE BOREHOLE LOCATIONS AND SAMPLING DEPTHS

To confirm that site contamination has been remediated to within acceptable levels, Parsons ES proposes to drill and sample two additional boreholes. Proposed borehole locations are shown on Figure 4.1. Samples for chemical analysis will be collected at 5-foot intervals, beginning at 5 feet bgs. Sampling will continue at 5-foot intervals until two consecutive samples have no field evidence of contamination (i.e., soil with above-background photo ionization detector (PID) and total volatile hydrocarbon analyzer (TVHA) readings, petroleum odor, or discoloration).

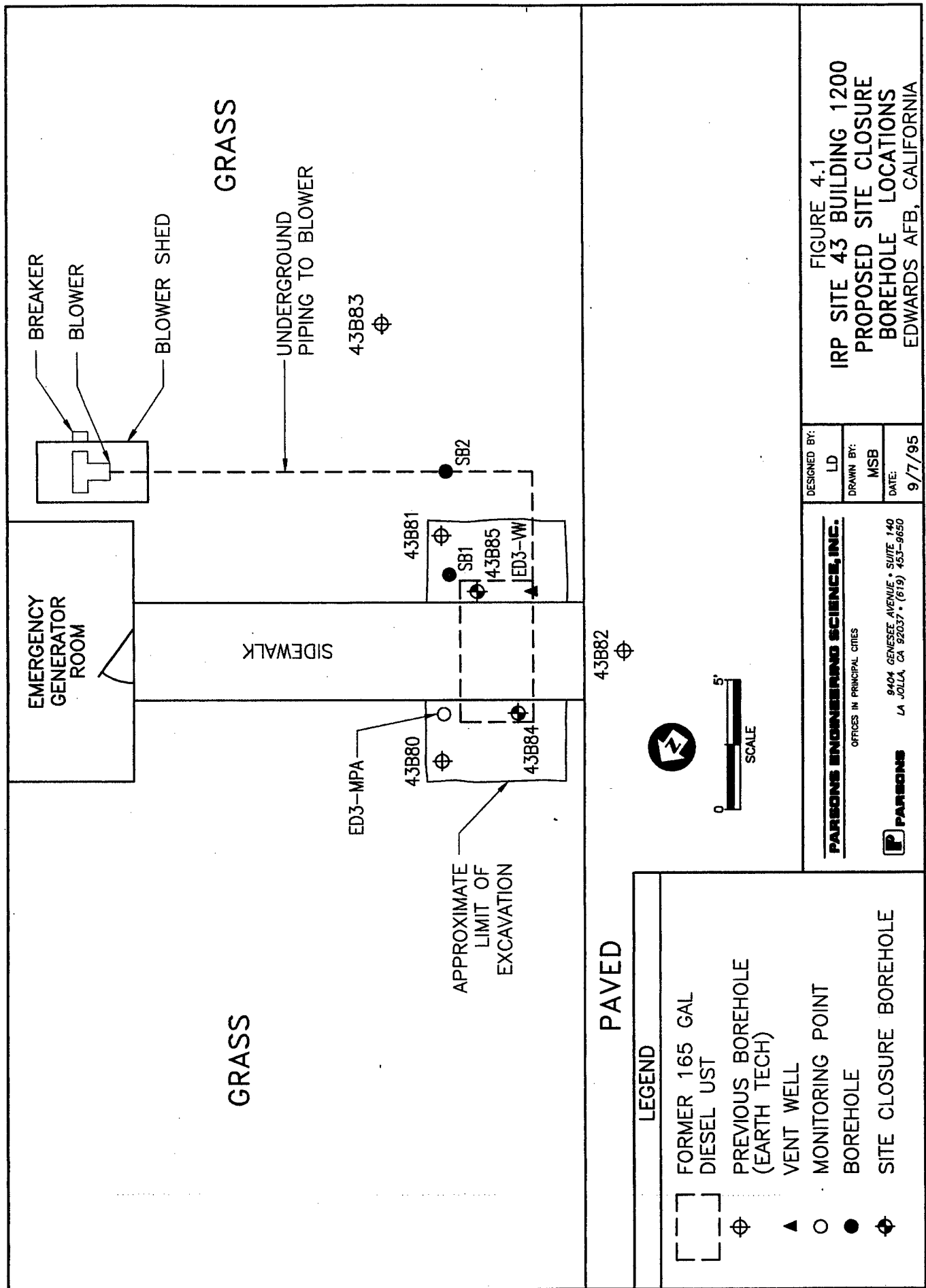
In the unlikely event that analytical results indicate additional site remediation is required, the VW and MP will not be abandoned at this time. Should site closure be granted, Edwards AFB will make arrangements for the VW and MP to be properly abandoned (abandonment is not currently included in the Parsons ES' Scope of Work).

4.2 DRILLING, SAMPLING, AND EQUIPMENT DECONTAMINATION

Boreholes will be advanced using a drill rig equipped with 6-inch outside-diameter (OD) hollow-stem augers. Soil cuttings generated during drilling will be placed in US Department of Transportation (DOT)-approved, 55-gallon drums. The drums will be labeled with the site name, drilling date, borehole number, and depth intervals. Drums will be transported by the drilling subcontractor to the Base Hazardous Waste Storage Area or as directed by the Base point of contact. Cuttings disposal will be the Bases responsibility.

Boreholes will be logged by a Parsons ES geologist. Soil types will be classified according to the Unified Soil Classification System (USCS) and described in accordance with the standard Parsons ES soil description format.

Before use and between boreholes, augers and other downhole equipment will be cleaned to prevent cross-contamination. Cleaning will be accomplished using a high-pressure hot-water wash, followed by a potable water rinse. Decontamination fluids will be collected and contained in labeled 55-gallon drums.



Relatively undisturbed soil samples, suitable for chemical analysis, will be collected at approximately 5-foot intervals unless specified otherwise. Soil samples will be collected in a 2.5-inch inside-diameter (ID) split-barrel sampler that will be lowered through the hollow stem of the augers and driven approximately 1.5 feet (or to refusal, if shallower) into undisturbed soil, ahead of the augers. Between sampling events, the split-barrel sampler will be cleaned with Alconox® detergent, followed by successive potable and distilled water rinses.

The split-sampler will be fitted with three precleaned, 2.5-inch OD by 6-inch-long, thin-walled, brass sleeves. Before samples are collected, sample sleeves will be cleaned using the same procedure as that for the sampler. After collection of a sample, the sampler will be retrieved, split apart, and the sleeves will be removed. The ends of the lowest sleeve that contains the sample for chemical analysis will be covered with Teflon® sheets and plastic end caps.

The upper sample sleeves will be used for logging purposes, and will be screened in the field for organic vapors using a PID and a TVHA. The data obtained from the logging and screening will be recorded on the borehole logs.

The sleeves for chemical analysis will be labeled with the site name and borehole number, sample depth, date of collection, project name, and other pertinent data. These sleeves will be placed immediately in an insulated shipping container with ice, and will be maintained in a chilled condition until delivered to the analytical laboratory. Chain-of-custody records will be prepared in the field and will accompany the samples to the analytical laboratory.

After sampling, boreholes will be backfilled with bentonite chips (hole plug) to approximately 1 foot bgs. The bentonite will be hydrated during placement at a rate of 2 to 5 gallons of water per 50-pound bag of chips. A concrete cap approximately 1-foot thick will be placed on top of the bentonite.

In the unlikely event that two consecutive "clean" samples are not collected before the groundwater table is encountered, a groundwater monitoring well will be installed. Well screen will consist of 2-inch internal diameter Schedule 40 PVC with 0.020-inch slots. The screen will extend approximately 10 feet into and five feet above the saturated zone. A No. 3 Lone Star (or equivalent) filter sand will be placed in the annulus to one foot above the screen. A bentonite pellet seal 3-feet thick will be placed above the filter pack. The remaining annulus to 1 foot bgs will be filled with bentonite chips. A water-tight well vault will be installed in a 2.5- x 2.5- x 8-inch deep concrete slab flush with the ground surface.

Additional information on well development purging sampling and analysis will be submitted to Kern County should well installation become necessary.

4.3 SOIL SAMPLE ANALYSIS

Proposed sample analytical methods and detection limits are presented in Table 4.1. All samples will be analyzed by a State of California-certified and AFCEE-approved laboratory.

Parsons ES proposes to analyze all soil samples by EPA Method SW8015 Modified for TPH as diesel and by EPA Method SW8020 for BTEX. Because the former UST contained diesel fuel (not gasoline) Parsons ES does not propose analyzing for lead or any other possible fuel additives. TPH results will be reported for each carbon chain (i.e., C4-C23+). This will allow for comparison with greater accuracy to California RWQCB (1995) clean-up standards listed in the *Interim Guidance For Remediation of Petroleum Impacted Sites* (see Subsection 3.2).

Table 4.1
Proposed Soil Sample Analytical Methods and
Practical Quantitation Limits

Analytical Method	PQL (mg/kg) ^{a/}
EPA SW8015 Modified for Diesel ^{b/} (California Department of Health Services Method)	5.0
EPA SW8020	
Benzene	0.001
Toluene	0.005
Ethylbenzene	0.005
Xylenes	0.05

^{a/} PQL = practical quantitation limit; mg/kg = milligrams per kilogram

^{b/} Results will be reported for each carbon chain using the simulated distillation method.

SECTION 5

SITE CLOSURE REPORT FORMAT

Following receipt of the laboratory analytical results, a site closure report will be prepared and submitted to Kern County, Edwards AFB, and AFCEE.

The report will contain the following information for each site:

- Plot plans showing final borehole locations;
- Summary of field activities;
- Assessment of analytical results in comparison to state cleanup criteria;
- Laboratory analytical reports and chain-of-custody forms;
- Borehole logs; and
- Conclusions and recommendations for site closure or additional cleanup action.

The report will be prepared and signed by a California Registered Geologist.

SECTION 6

REFERENCES

California Regional Water Quality Control Board, Los Angeles Region, (RWQCB). 1995. *Interim Site Assessment and Clean-up Guidebook*. Vol I. February.

Parsons Engineering Science, Inc. 1994. *Part I Bioventing Pilot Test Work Plan Former Diesel UST Areas IRP Sites 35a & 35c Part II Draft Bioventing Pilot Test Interim Results Report for IRP Site 35c*. Prepared for Air Force Center for Environmental Excellence and March AFB. July.

Tetra Tech, Inc. 1993 Preliminary Analytical Results and Draft Borehole Logs for IRP Site 35c. (Information not quality checked or validated).

APPENDIX B
FIELD BOREHOLE LOGS

Geologic Borehole and Well Completion Log

726876

Date	12/15/95	ESTDATE	0.00	ft. NCOORD	0.00	ft. ECOORD	0.00	ft. DEPTH	25.00
North	Establishing Company								
East	Drilling Company								
Borehole Total Depth	Drill Rig Type								
	Construction Method								
	ESCI	ESCODE	EDWD	EDWRD	AFID	LOCID			
	EDWD	EDWRD	AFID	LOCID					
	Air Force Installation								
	Location Identification								
	43B85								

Completion	Sampling	Depth feet	Lithology		Remarks
			USCS Unified Soil Classification System	Lithologic Symbols & Codes LITHCODE	
Elevation feet MSL 0.00	Instrument Reading Penetration	8 REC% 8 SMCODE SED			
	PID 0.20 PPM 6/9/10	3.50 SS 5.00			0.00' no odor in cuttings -LAD
	74/80	8.50 10.00			3.50' no odor -LAD
	PID 0.40 PPM 25/55/64	13.50 SS 15.00	SM		8.50' no recovery (dry, near vent well), use sand trap, no odor in cuttings -LAD
	PID 0.40 PPM 48/68/78	18.50 SS 20.00			13.50' no odor -LAD
	PID 0.80 PPM 20/31/38	23.50 SS 25.00	SP		18.50' no odor -LAD
					23.50' no odor -LAD

43B85

Geologic Borehole and Well Completion Log

EDWRD 43B85 TD 25.00' 1"=6.00' 1:72.00 960326 1620 Sheet 1 of 1

PARSONS
ENGINEERING SCIENCE, INC.
San Diego, CA (619) 453-9650

APPENDIX C
LABORATORY ANALYTICAL RESULTS

Quanterra Incorporated
1721 South Grand Avenue
Santa Ana, California 92705

714 258-8610 Telephone
714 258-0921 Fax

RECEIVED

JAN 03 1996

PARSONS ENGINEERING
SCIENCE, INC. - LA JOLLA

December 29, 1995

PARSONS ENGINEERING SCIENCE
9404 GENESEE AVENUE, SUITE 140
LA JOLLA, CA 92037
ATTN: MR. LARRY DUDUS

LIMS NO.: 116457-0001/0014
DATE SAMPLED: 15-DEC-1995
DATE SAMPLE REC'D: 16-DEC-1995
PROJECT: EAFB BIOVENTING SITE CLOSURE

Enclosed with this letter is the report containing the analytical results for the project specified above.

The Narrative section included in the following attachment provides a detailed description of all events that occurred during sample processing, analysis, and data review as applicable to the samples and analytical methods requested.

Report data sheets contain a list of the requested constituents measured in each test, the analytical results, and the standard reporting limit (RL). Reporting limits are adjusted to reflect any dilution or dry weight correction, when applicable. Solid and waste matrix samples are reported on a [dry wt/as received] for this report. Also provided in this report are the LIMS Report Key and the terms and abbreviations commonly used in our reports.

Preliminary data were provided on December 29, 1995 at 2:50PM to Larry Dudus.

The report shall not be reproduced except in full, without the written approval of the laboratory.

If you have any questions regarding the data provided in this report, please call Tracy Sidwell at (714) 258-8610. Release of this report has been authorized by the Lab Director or the designee as demonstrated by the following signature.

Sincerely,


Project Manager

cc: Project File

LIMS REPORT KEY

Section	Description
Cover letter	Signature page, report narrative as applicable.
Sample Description Information	Tabulated cross-reference between the Lab ID and Client ID, including matrix, date and time sampled and the date received for all samples in the project.
Sample Analysis Results Sheets	Lists sample results, test components, reporting limit, dates prepared and analyzed and any data qualifiers. Pages are organized by test.
QC Lot Assignment Report	Cross-reference between lab ID's and applicable QC batches (DCS, LCS, SCS, Blank, MS/SD, DU)
Duplicate Control Sample Report	Percent recovery and RPD results, with acceptance limits, for the laboratory duplicate control samples for each test are tabulated in this report. These are measures of accuracy and precision for each test. Acceptance limits are based upon laboratory historical data.
Laboratory Control Sample Report	Percent recovery results for a single Laboratory Control Sample (if applicable) are tabulated in this report, with the applicable acceptance limits for each test.
Matrix Spike/Matrix Spike Duplicate Report	Percent recovery and RPD results for matrix-specific QC samples and acceptance limits, where applicable. This report can be used to assess matrix effects on an analysis.
Single Control Sample Report	A tabulation of the surrogate recoveries for the blank for organic analyses.
Method Blank Report	A summary of the results of the analysis of the method blank for each test.

List of Abbreviations and Terms

DCS	Duplicate Control Sample	MSD	Matrix Spike Duplicate
DU	Sample Duplicate	QC Run	Preparation batch
EB	Equipment Blank	QC Category	LIMS QC Category
FB	Field Blank	QC Lot	DCS batch
FD	Field Duplicate	ND	Not Detected at the reporting limit expressed
IDL	Instrument Detection Limit (Metals)	QC Matrix	Matrix of the laboratory control sample (s)
LCS	Laboratory Control Sample	RL	Reporting Limit
MB	Method Blank	QC	Quality Control
MDL	Method Detection Limit (Organics)	SA	Sample
MS	Matrix Spike	SD	See MSD
RPD	Relative Percent Difference	TB	Trip Blank
ppm (parts per million)	mg/L or mg/kg	ppb (parts-per-billion)	ug/L or ug/kg
QUAL	Qualifier flag	DIL	Dilution Factor

Refer to the Quanterra Incorporated Quality Assurance Program Plan for detailed explanations of terms summarized above.

TABLE OF CONTENTS

LIMS # 116457

Cover Letter	1
LIMS Report Key	2
Table of Contents	3
Narrative	4
Chain-of-Custody Records and Sample Description Information	
Analytical Results Summary (LIMS Report)	
A. LIMS Datasheets	
B. QC Summaries	

NARRATIVE

LIMS # 116457

I. CONDITION UPON RECEIPT

Cooler was received intact. The temperature of the cooler was 3.2°C.

Sample containers were received intact. The VOA vials did not have headspace. Sample container labels did agree with the COC as to ID, collection date/time, tests and preservatives.

Samples were received on time to meet the method holding time specifications. All discrepancies identified upon sample receipt have been forwarded to the client and are documented in the enclosed COC records.

II. ORGANIC ANALYSES

HOLDING TIME

All samples were prepared and analyzed within the method specified holding time requirements.

METHOD BLANK

All method blanks met QC criteria.

MS/MSD/LCS/DCS/RPD'S AND SURROGATE RECOVERY

All surrogate spike recovery and RPD data met QC criteria.

CALIBRATIONS

All calibrations and calibration verifications met QC criteria.

SAMPLE RESULTS

The chain of custody did not list requested analysis information for sample **TRIP BLANK** (116457-0010). The sample was analyzed using California Department of Health Services (CDHS) modified method 8015 for gasoline and USEPA modified method 8020 for benzene, toluene, ethylbenzene and total xylenes (BTEX) per client instructions on December 18, 1995.

Laboratory analyses for samples **43B85 19.0-19.5MS** and **43B85 14.0-14.5MSD** were canceled per client instructions on December 18, 1995. Client specific QC (MS/MSD) was performed on sample **43B85 14.5-15.0**.

Chain of Custody Record

QUA-4124-1



Client	PARSONS ES	Project Manager	LARLEY DUDOS	Date	12/15/95	Chain Of Custody Number	48310
Address	9404 GENESEE AVE SUITE 140	Telephone Number (Area Code)/Fax Number	619 453 9038	Lab Number	116457	Page	1 of 2
City	LA JOLLA	Site Code	CA 92057	Lab Contact			
Project Name	EAFB BROWNING SITE CLOSURE	Carrier/Waybill Number					

City	State	Zip Code	Site Contact	Lab Contact	Analysis (Attach list if more space is needed)										Special Instructions/ Conditions of Receipt				
Project Name			Carrier/Waybill Number		Matrix		Containers & Preservatives												
					Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH		ZnAc/NaOH					
Sample I.D. No. and Description (Containers for each sample may be combined on one line)			Date	Time															
43B 84 40-4.5-5.0			12/15	944			X	X	X					SW 8020	X	SW 8015	X	SW 805	
43B 84 9.5-10.0				948			X	X	X					X	X	X	X		
43B 84 14.5-15.0				956			X	X	X					X	X	X	X		
43B 84 19.5-20.0				959			X	X	X					X	X	X	X		
43B 84 24.5-25.0				10:01			X	X	X					X	X	X	X		
43B 85 4.5 5.0				10:56			X	X	X					X	X	X	X		
43B 85 14.5 15.0				11:12			X	X	X					X	X	X	X		
43B 85 19.5-20.0				11:20			X	X	X					X	X	X	X		
43B 85 24.5-25.0				11:28			X	X	X					X	X	X	X		
TRIP BLANK					X														
RINSE BLANK				12:11	X									X	X	X	X		

Possible Hazard Identification	<input checked="" type="checkbox"/> Non-Hazard	<input type="checkbox"/> Flammable	<input type="checkbox"/> Skin Irritant	<input type="checkbox"/> Poison B	<input type="checkbox"/> Unknown	Sample Disposal	<input checked="" type="checkbox"/> Disposal By Lab	<input type="checkbox"/> Archive For	(A fee may be assessed if samples are retained longer than 3 months)
Turn Around Time Required	<input type="checkbox"/> 24 Hours	<input type="checkbox"/> 48 Hours	<input type="checkbox"/> 72 Hours	<input type="checkbox"/> 14 Days	<input type="checkbox"/> 21 Days	<input type="checkbox"/> Other	<input type="checkbox"/> Return To Client	<input type="checkbox"/> Months	
1. Relinquished By	Date		Time		12/15/95 1600		1. Received By		Date
2. Relinquished By	Date		Time		12/15/95 1600		2. Received By		Date
3. Relinquished By	Date		Time				3. Received By		Date

SAMPLE DESCRIPTION INFORMATION
 for
 Parsons Engineering Science

Lab ID	Client ID	Matrix	Sampled Date	Time	Received Date
116457-0001-SA	43B84 (4.50,5.00,)	SOIL	15 DEC 95	09:44	16 DEC 95
116457-0002-SA	43B84 (9.50,10.00,)	SOIL	15 DEC 95	09:48	16 DEC 95
116457-0003-SA	43B84 (14.50,15.00,)	SOIL	15 DEC 95	09:56	16 DEC 95
116457-0004-SA	43B84 (19.50,20.00,)	SOIL	15 DEC 95	09:59	16 DEC 95
116457-0005-SA	43B84 (24.50,25.00,)	SOIL	15 DEC 95	10:01	16 DEC 95
116457-0006-SA	43B85 (4.50,5.00,)	SOIL	15 DEC 95	10:56	16 DEC 95
116457-0007-SA	43B85 (14.50,15.00,)	SOIL	15 DEC 95	11:12	16 DEC 95
116457-0007-MS	43B85MS (14.50,15.00,)	SOIL	15 DEC 95	11:12	16 DEC 95
116457-0007-SD	43B85MSD (14.50,15.00,)	SOIL	15 DEC 95	11:12	16 DEC 95
116457-0008-SA	43B85 (19.50,20.00,)	SOIL	15 DEC 95	11:20	16 DEC 95
116457-0009-SA	43B85 (24.50,25.00,)	SOIL	15 DEC 95	11:28	16 DEC 95
116457-0010-TB	TRIP BLANK (0.00,0.00,)	WATER-QA	15 DEC 95		16 DEC 95
116457-0011-EB	RINSATE BLANK (0.00,0.00,)	WATER-QA	15 DEC 95	12:11	16 DEC 95
116457-0012-SA	43B86 (4.50,5.00,)	SOIL	15 DEC 95	14:20	16 DEC 95
116457-0013-SA	43B85MS (19.00,19.50,)	SOIL	15 DEC 95	11:20	16 DEC 95
116457-0014-SA	43B85MSD (14.00,14.50,)	SOIL	15 DEC 95	11:12	16 DEC 95



Environmental
Services

GENERAL INORGANICS

Client Name: Parsons Engineering Science
Client ID: 43B84 (4.50,5.00,)
LAB ID: 116457-0001-SA
Matrix: SOIL
Authorized: 18 DEC 95

Sampled: 15 DEC 95
Prepared: See Below

Received: 16 DEC 95
Analyzed: See Below

Parameter	Result	Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
Percent Water	11		1.0	0.10	%	D2216	NA	21 DEC 95



Environmental
Services

GENERAL INORGANICS

Client Name: Parsons Engineering Science
Client ID: 43B84 (9.50,10.00,)
LAB ID: 116457-0002-SA
Matrix: SOIL
Authorized: 18 DEC 95

Sampled: 15 DEC 95
Prepared: See Below

Received: 16 DEC 95
Analyzed: See Below

Parameter	Result	Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
Percent Water	1.6		1.0	0.10	%	D2216	NA	21 DEC 95

GENERAL INORGANICS

Client Name: Parsons Engineering Science
Client ID: 43B84 (14.50,15.00,)
LAB ID: 116457-0003-SA
Matrix: SOIL
Authorized: 18 DEC 95

Sampled: 15 DEC 95
Prepared: See Below

Received: 16 DEC 95
Analyzed: See Below

Parameter	Result	Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
Percent Water	7.0		1.0	0.10	%	D2216	NA	21 DEC 95



Environmental
Services

GENERAL INORGANICS

Client Name: Parsons Engineering Science
Client ID: 43B84 (19.50,20.00,)
LAB ID: 116457-0004-SA
Matrix: SOIL
Authorized: 18 DEC 95

Sampled: 15 DEC 95
Prepared: See Below

Received: 16 DEC 95
Analyzed: See Below

Parameter	Result	Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
Percent Water	8.6		1.0	0.10	%	D2216	NA	21 DEC 95



Environmental
Services

GENERAL INORGANICS

Client Name: Parsons Engineering Science
Client ID: 43B84 (24.50,25.00,)
LAB ID: 116457-0005-SA
Matrix: SOIL
Authorized: 18 DEC 95

Sampled: 15 DEC 95
Prepared: See Below

Received: 16 DEC 95
Analyzed: See Below

Parameter	Result	Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
Percent Water	7.5		1.0	0.10	%	D2216	NA	21 DEC 95

GENERAL INORGANICS

Client Name: Parsons Engineering Science
Client ID: 43B85 (4.50,5.00,)
LAB ID: 116457-0006-SA
Matrix: SOIL
Authorized: 18 DEC 95

Sampled: 15 DEC 95
Prepared: See Below

Received: 16 DEC 95
Analyzed: See Below

Parameter	Result	Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
Percent Water	6.4		1.0	0.10	%	D2216	NA	21 DEC 95



Environmental
Services

GENERAL INORGANICS

Client Name: Parsons Engineering Science
Client ID: 43B85 (14.50,15.00,)
LAB ID: 116457-0007-SA
Matrix: SOIL
Authorized: 18 DEC 95

Sampled: 15 DEC 95
Prepared: See Below

Received: 16 DEC 95
Analyzed: See Below

Parameter	Result	Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
Percent Water	8.2		1.0	0.10	%	D2216	NA	21 DEC 95



Environmental
Services

GENERAL INORGANICS

Client Name: Parsons Engineering Science
Client ID: 43B85 (19.50,20.00,)
LAB ID: 116457-0008-SA
Matrix: SOIL
Authorized: 18 DEC 95

Sampled: 15 DEC 95
Prepared: See Below

Received: 16 DEC 95
Analyzed: See Below

Parameter	Result	Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
Percent Water	6.5		1.0	0.10	%	D2216	NA	21 DEC 95



Environmental
Services

GENERAL INORGANICS

Client Name: Parsons Engineering Science
Client ID: 43B85 (24.50,25.00,)
LAB ID: 116457-0009-SA
Matrix: SOIL
Authorized: 18 DEC 95

Sampled: 15 DEC 95
Prepared: See Below

Received: 16 DEC 95
Analyzed: See Below

Parameter	Result	Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
Percent Water	7.0		1.0	0.10	%	D2216	NA	21 DEC 95

GENERAL INORGANICS

Client Name: Parsons Engineering Science
Client ID: 43B86 (4.50,5.00,)
LAB ID: 116457-0012-SA
Matrix: SOIL
Authorized: 18 DEC 95

Sampled: 15 DEC 95
Prepared: See Below

Received: 16 DEC 95
Analyzed: See Below

Parameter	Result	Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
Percent Water	4.6		1.0	0.10	%	D2216	NA	21 DEC 95



Environmental
Services

Total Extractable Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science
Client ID: 43B84 (4.50,5.00,)
LAB ID: 116457-0001-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/FID-T5

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 20 DEC 95

Parameter	Result	Qualifier	RL	Units
Diesel Fuel #2	ND		11	mg/kg
Unknown extractable hydrocarbon	ND		11	mg/kg
Surrogate	Recovery		Acceptable Range	
Benzo(a)pyrene	83	%	50 - 150	

Percent moisture is 11%.

All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Extractable Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science

Client ID: 43B84 (9.50,10.00,)

LAB ID: 116457-0002-SA

Matrix: SOIL

Authorized: 18 DEC 95

Instrument: GC/FID-T5

Sampled: 15 DEC 95

Prepared: 19 DEC 95

Dilution: 1.0

Received: 16 DEC 95

Analyzed: 20 DEC 95

Parameter	Result	Qualifier	RL	Units
Diesel Fuel #2	ND		10	mg/kg
Unknown extractable hydrocarbon	ND		10	mg/kg
Surrogate	Recovery		Acceptable Range	
Benzo(a)pyrene	78	%	50 - 150	

Percent moisture is 1.6%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Extractable Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science

Client ID: 43B84 (14.50,15.00,)

LAB ID: 116457-0003-SA

Matrix: SOIL

Sampled: 15 DEC 95

Received: 16 DEC 95

Authorized: 18 DEC 95

Prepared: 19 DEC 95

Analyzed: 20 DEC 95

Instrument: GC/FID-T5

Dilution: 1.0

Parameter	Result	Qualifier	RL	Units
Diesel Fuel #2	ND		11	mg/kg
Unknown extractable hydrocarbon	ND		11	mg/kg
Surrogate	Recovery		Acceptable Range	
Benzo(a)pyrene	78	%	50 - 150	

Percent moisture is 7.0%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Extractable Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science
Client ID: 43B84 (19.50,20.00,)
LAB ID: 116457-0004-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/FID-T5

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 20 DEC 95

Parameter	Result	Qualifier	RL	Units
Diesel Fuel #2	ND		11	mg/kg
Unknown extractable hydrocarbon	ND		11	mg/kg
Surrogate	Recovery		Acceptable Range	
Benzo(a)pyrene	84	%	50 - 150	

Percent moisture is 8.6%. All results and limits are reported on a dry weight basis.

ND = Not Detected

Total Extractable Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science
Client ID: 43B84 (24.50,25.00,)
LAB ID: 116457-0005-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/FID-T5

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 20 DEC 95

Parameter	Result	Qualifier	RL	Units
Diesel Fuel #2	ND		11	mg/kg
Unknown extractable hydrocarbon	ND		11	mg/kg
Surrogate	Recovery		Acceptable Range	
Benzo(a)pyrene	85	%	50 - 150	

Percent moisture is 7.5%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Extractable Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science

Client ID: 43B85 (4.50,5.00,)

LAB ID: 116457-0006-SA

Matrix: SOIL

Authorized: 18 DEC 95

Instrument: GC/FID-T5

Sampled: 15 DEC 95

Prepared: 19 DEC 95

Dilution: 1.0

Received: 16 DEC 95

Analyzed: 20 DEC 95

Parameter	Result	Qualifier	RL	Units
Diesel Fuel #2	ND		11	mg/kg
Unknown extractable hydrocarbon	ND		11	mg/kg
Surrogate	Recovery		Acceptable Range	
Benzo(a)pyrene	86	%	50 - 150	

Percent moisture is 6.4%. All results and limits are reported on a dry weight basis.

ND = Not Detected

Total Extractable Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science
Client ID: 43B85 (14.50,15.00,)
LAB ID: 116457-0007-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/FID-T5

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 20 DEC 95

Parameter	Result	Qualifier	RL	Units
Diesel Fuel #2	ND		11	mg/kg
Unknown extractable hydrocarbon	ND		11	mg/kg
Surrogate	Recovery		Acceptable Range	
Benzo (a) pyrene	84	%	50 - 150	

Percent moisture is 8.2%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Extractable Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science

Client ID: 43B85 (19.50,20.00,)

LAB ID: 116457-0008-SA

Matrix: SOIL

Authorized: 18 DEC 95

Instrument: GC/FID-T5

Sampled: 15 DEC 95

Prepared: 19 DEC 95

Dilution: 1.0

Received: 16 DEC 95

Analyzed: 20 DEC 95

Parameter	Result	Qualifier	RL	Units
Diesel Fuel #2	ND		11	mg/kg
Unknown extractable hydrocarbon	ND		11	mg/kg
Surrogate	Recovery		Acceptable Range	
Benzo(a)pyrene	83	%	50 - 150	

Percent moisture is 6.5%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Extractable Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science
Client ID: 43B85 (24.50,25.00,)
LAB ID: 116457-0009-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/FID-T5

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 21 DEC 95

Parameter	Result	Qualifier	RL	Units
Diesel Fuel #2	ND		11	mg/kg
Unknown extractable hydrocarbon	ND		11	mg/kg
Surrogate	Recovery		Acceptable Range	
Benzo(a)pyrene	77	%	50 - 150	

Percent moisture is 7.0%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Extractable Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science
Client ID: RINSATE BLANK (0.00,0.00,)
LAB ID: 116457-0011-EB
Matrix: WATER-QA
Authorized: 18 DEC 95
Instrument: GC/FID-T5

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 21 DEC 95

Parameter	Result	Qualifier	RL	Units
Diesel Fuel #2	ND		1.0	mg/L
Unknown extractable hydrocarbon	ND		1.0	mg/L
Surrogate	Recovery		Acceptable Range	
Benzo(a)pyrene	93	%	50 - 150	

ND = Not Detected



Environmental
Services

Total Extractable Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science
Client ID: 43B86 (4.50,5.00,)
LAB ID: 116457-0012-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/FID-T5

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 21 DEC 95

Parameter	Result	Qualifier	RL	Units
Diesel Fuel #2	ND		10	mg/kg
Unknown extractable hydrocarbon	ND		10	mg/kg
Surrogate	Recovery		Acceptable Range	
Benzo(a)pyrene	85	%	50 - 150	

Percent moisture is 4.6%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Volatile Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science

Client ID: 43B84 (4.50,5.00,)

LAB ID: 116457-0001-SA

Matrix: SOIL

Authorized: 18 DEC 95

Instrument: GC/FID-B1

Sampled: 15 DEC 95

Prepared: 19 DEC 95

Dilution: 1.0

Received: 16 DEC 95

Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Gasoline	ND		1.1	mg/kg
Unknown volatile hydrocarbon	ND		1.1	mg/kg
Surrogate	Recovery		Acceptable Range	
a,a,a-Trifluorotoluene	86	%	50 - 150	

Percent moisture is 11%.

All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Volatile Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science

Client ID: 43B84 (9.50,10.00,)

LAB ID: 116457-0002-SA

Matrix: SOIL

Authorized: 18 DEC 95

Instrument: GC/FID-B1

Sampled: 15 DEC 95

Prepared: 19 DEC 95

Dilution: 1.0

Received: 16 DEC 95

Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Gasoline	ND		1.0	mg/kg
Unknown volatile hydrocarbon	ND		1.0	mg/kg
Surrogate	Recovery		Acceptable Range	
a,a,a-Trifluorotoluene	90	%	50 - 150	

Percent moisture is 1.6%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Volatile Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science

Client ID: 43B84 (14.50,15.00,)

LAB ID: 116457-0003-SA

Matrix: SOIL

Authorized: 18 DEC 95

Instrument: GC/FID-B1

Sampled: 15 DEC 95

Prepared: 19 DEC 95

Dilution: 1.0

Received: 16 DEC 95

Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Gasoline	ND		1.1	mg/kg
Unknown volatile hydrocarbon	ND		1.1	mg/kg
Surrogate	Recovery		Acceptable Range	
a,a,a-Trifluorotoluene	94	%	50 - 150	

Percent moisture is 7.0%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Volatile Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science
Client ID: 43B84 (19.50,20.00,)
LAB ID: 116457-0004-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/FID-B1

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Gasoline	ND		1.1	mg/kg
Unknown volatile hydrocarbon	ND		1.1	mg/kg
Surrogate	Recovery		Acceptable Range	
a,a,a-Trifluorotoluene	90	%	50 - 150	

Percent moisture is 8.6%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Volatile Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science
Client ID: 43B84 (24.50,25.00,)
LAB ID: 116457-0005-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/FID-B1

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Gasoline	ND		1.1	mg/kg
Unknown volatile hydrocarbon	ND		1.1	mg/kg
Surrogate	Recovery		Acceptable Range	
a,a,a-Trifluorotoluene	84	%	50 - 150	

Percent moisture is 7.5%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Volatile Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science

Client ID: 43B85 (4.50,5.00,)

LAB ID: 116457-0006-SA

Matrix: SOIL

Authorized: 18 DEC 95

Instrument: GC/FID-B1

Sampled: 15 DEC 95

Prepared: 19 DEC 95

Dilution: 1.0

Received: 16 DEC 95

Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Gasoline	ND		1.1	mg/kg
Unknown volatile hydrocarbon	ND		1.1	mg/kg
Surrogate	Recovery		Acceptable Range	
a,a,a-Trifluorotoluene	85	%	50 - 150	

Percent moisture is 6.4%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Volatile Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science

Client ID: 43B85 (14.50,15.00,)

LAB ID: 116457-0007-SA

Matrix: SOIL

Authorized: 18 DEC 95

Instrument: GC/FID-B1

Sampled: 15 DEC 95

Prepared: 19 DEC 95

Dilution: 1.0

Received: 16 DEC 95

Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Gasoline	ND		1.1	mg/kg
Unknown volatile hydrocarbon	ND		1.1	mg/kg
Surrogate	Recovery		Acceptable Range	
a,a,a-Trifluorotoluene	84	%	50 - 150	

Percent moisture is 8.2%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Volatile Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science

Client ID: 43B85 (19.50,20.00,)

LAB ID: 116457-0008-SA

Matrix: SOIL

Authorized: 18 DEC 95

Instrument: GC/FID-B1

Sampled: 15 DEC 95

Prepared: 19 DEC 95

Dilution: 1.0

Received: 16 DEC 95

Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Gasoline	ND		1.1	mg/kg
Unknown volatile hydrocarbon	ND		1.1	mg/kg
Surrogate	Recovery		Acceptable Range	
a,a,a-Trifluorotoluene	79	%	50 - 150	

Percent moisture is 6.5%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Volatile Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science

Client ID: 43B85 (24.50,25.00,)

LAB ID: 116457-0009-SA

Matrix: SOIL

Authorized: 18 DEC 95

Instrument: GC/FID-B1

Sampled: 15 DEC 95

Prepared: 19 DEC 95

Dilution: 1.0

Received: 16 DEC 95

Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Gasoline	ND		1.1	mg/kg
Unknown volatile hydrocarbon	ND		1.1	mg/kg
Surrogate	Recovery		Acceptable Range	
a,a,a-Trifluorotoluene	84	%	50 - 150	

Percent moisture is 7.0%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Total Volatile Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science
Client ID: TRIP BLANK (0.00,0.00,)
LAB ID: 116457-0010-TB
Matrix: WATER-QA
Authorized: 18 DEC 95
Instrument: GC/FID-VCB

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Gasoline	ND		0.10	mg/L
Unknown volatile hydrocarbon	ND		0.10	mg/L
Surrogate	Recovery		Acceptable Range	
a,a,a-Trifluorotoluene	80	%	50 - 150	

ND = Not Detected



Environmental
Services

Total Volatile Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science
Client ID: RINSATE BLANK (0.00,0.00,)
LAB ID: 116457-0011-EB
Matrix: WATER-QA
Authorized: 18 DEC 95
Instrument: GC/FID-VCB

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Gasoline	ND		0.10	mg/L
Unknown volatile hydrocarbon	ND		0.10	mg/L
Surrogate	Recovery		Acceptable Range	
a,a,a-Trifluorotoluene	81	%	50 - 150	

ND = Not Detected



Environmental
Services

Total Volatile Petroleum Hydrocarbons
Method 8015 Modified (CADHS)

Client Name: Parsons Engineering Science

Client ID: 43B86 (4.50,5.00,)

LAB ID: 116457-0012-SA

Matrix: SOIL

Authorized: 18 DEC 95

Instrument: GC/FID-B1.

Sampled: 15 DEC 95

Prepared: 19 DEC 95

Dilution: 1.0

Received: 16 DEC 95

Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Gasoline	ND		1.0	mg/kg
Unknown volatile hydrocarbon	ND		1.0	mg/kg
Surrogate	Recovery		Acceptable Range	
a,a,a-Trifluorotoluene	87	%	50 - 150	

Percent moisture is 4.6%.

All results and limits are reported on a dry weight basis.

ND = Not Detected

Aromatic Volatile Organics
Method 8020

Client Name: Parsons Engineering Science
Client ID: 43B84 (4.50,5.00,)
LAB ID: 116457-0001-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/PID-VKA

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Benzene	ND		1.1	ug/kg
Toluene	ND		5.6	ug/kg
Ethylbenzene	ND		5.6	ug/kg
Xylenes (total)	ND		5.6	ug/kg
Surrogate	Recovery		Acceptable Range	
Bromofluorobenzene	79	%	30 - 137	

Percent moisture is 11%.

All results and limits are reported on a dry weight basis.

ND = Not Detected

Aromatic Volatile Organics
Method 8020

Client Name: Parsons Engineering Science
Client ID: 43B84 (9.50,10.00,)
LAB ID: 116457-0002-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/PID-VKA

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Benzene	ND		1.0	ug/kg
Toluene	ND		5.1	ug/kg
Ethylbenzene	ND		5.1	ug/kg
Xylenes (total)	ND		5.1	ug/kg
Surrogate	Recovery		Acceptable Range	
Bromofluorobenzene	70	%	30 - 137	

Percent moisture is 1.6%. All results and limits are reported on a dry weight basis.

ND = Not Detected

Aromatic Volatile Organics
Method 8020

Client Name: Parsons Engineering Science
Client ID: 43B84 (14.50,15.00,)
LAB ID: 116457-0003-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/PID-VKA

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Benzene	ND		1.1	ug/kg
Toluene	ND		5.4	ug/kg
Ethylbenzene	ND		5.4	ug/kg
Xylenes (total)	ND		5.4	ug/kg
Surrogate	Recovery		Acceptable Range	
Bromofluorobenzene	82	%	30 - 137	

Percent moisture is 7.0%. All results and limits are reported on a dry weight basis.

ND = Not Detected



Environmental
Services

Aromatic Volatile Organics
Method 8020

Client Name: Parsons Engineering Science
Client ID: 43B84 (19.50,20.00,)
LAB ID: 116457-0004-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/PID-VKA

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Benzene	ND		1.1	ug/kg
Toluene	ND		5.5	ug/kg
Ethylbenzene	ND		5.5	ug/kg
Xylenes (total)	ND		5.5	ug/kg
Surrogate	Recovery		Acceptable Range	
Bromofluorobenzene	78	%	30 - 137	

Percent moisture is 8.6%. All results and limits are reported on a dry weight basis.

ND = Not Detected

Aromatic Volatile Organics
Method 8020



Client Name: Parsons Engineering Science
Client ID: 43B84 (24.50,25.00,)
LAB ID: 116457-0005-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/PID-VKA

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Benzene	ND		1.1	ug/kg
Toluene	ND		5.4	ug/kg
Ethylbenzene	ND		5.4	ug/kg
Xylenes (total)	ND		5.4	ug/kg
Surrogate	Recovery		Acceptable Range	
Bromofluorobenzene	88	%	30 - 137	

Percent moisture is 7.5%. All results and limits are reported on a dry weight basis.

ND = Not Detected

Aromatic Volatile Organics
Method 8020

Client Name: Parsons Engineering Science
Client ID: 43B85 (4.50,5.00,)
LAB ID: 116457-0006-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/PID-VKA

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Benzene	ND		1.1	ug/kg
Toluene	ND		5.3	ug/kg
Ethylbenzene	ND		5.3	ug/kg
Xylenes (total)	ND		5.3	ug/kg

Surrogate	Recovery	Acceptable Range
Bromofluorobenzene	74 %	30 - 137

Percent moisture is 6.4%. All results and limits are reported on a dry weight basis.

ND = Not Detected

Aromatic Volatile Organics
Method 8020

Client Name: Parsons Engineering Science
Client ID: 43B85 (14.50,15.00,)
LAB ID: 116457-0007-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/PID-VKA

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Benzene	ND		1.1	ug/kg
Toluene	ND		5.4	ug/kg
Ethylbenzene	ND		5.4	ug/kg
Xylenes (total)	ND		5.4	ug/kg
Surrogate	Recovery		Acceptable Range	
Bromofluorobenzene	84	%	30 - 137	

Percent moisture is 8.2%. All results and limits are reported on a dry weight basis.

ND = Not Detected

Aromatic Volatile Organics
Method 8020

Client Name: Parsons Engineering Science
Client ID: 43B85 (19.50,20.00,)
LAB ID: 116457-0008-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/PID-VKA

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Benzene	ND		1.1	ug/kg
Toluene	ND		5.3	ug/kg
Ethylbenzene	ND		5.3	ug/kg
Xylenes (total)	ND		5.3	ug/kg

Surrogate	Recovery		Acceptable Range
Bromofluorobenzene	81	%	30 - 137

Percent moisture is 6.5%. All results and limits are reported on a dry weight basis.

ND = Not Detected

Aromatic Volatile Organics
Method 8020

Client Name: Parsons Engineering Science
Client ID: 43B85 (24.50,25.00,)
LAB ID: 116457-0009-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/PID-VKA

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Benzene	ND		1.1	ug/kg
Toluene	ND		5.4	ug/kg
Ethylbenzene	ND		5.4	ug/kg
Xylenes (total)	ND		5.4	ug/kg

Surrogate	Recovery		Acceptable Range
Bromofluorobenzene	80	%	30 - 137

Percent moisture is 7.0%. All results and limits are reported on a dry weight basis.

ND = Not Detected

Aromatic Volatile Organics
Method 8020

Client Name: Parsons Engineering Science
Client ID: TRIP BLANK (0.00,0.00,)
LAB ID: 116457-0010-TB
Matrix: WATER-QA
Authorized: 18 DEC 95
Instrument: GC/PID-VKA

Sampled: 15 DEC 95
Prepared: 21 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 21 DEC 95

Parameter	Result	Qualifier	RL	Units
Benzene	ND		0.50	ug/L
Toluene	ND		1.0	ug/L
Ethylbenzene	ND		1.0	ug/L
Xylenes (total)	ND		1.0	ug/L
Surrogate	Recovery		Acceptable Range	
Bromofluorobenzene	88	%	29 - 137	

ND = Not Detected

Aromatic Volatile Organics
Method 8020

Client Name: Parsons Engineering Science
Client ID: RINSATE BLANK (0.00,0.00,)
LAB ID: 116457-0011-EB
Matrix: WATER-QA
Authorized: 18 DEC 95
Instrument: GC/PID-VKA

Sampled: 15 DEC 95
Prepared: 21 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 21 DEC 95

Parameter	Result	Qualifier	RL	Units
Benzene	ND		0.50	ug/L
Toluene	ND		1.0	ug/L
Ethylbenzene	ND		1.0	ug/L
Xylenes (total)	ND		1.0	ug/L

Surrogate	Recovery		Acceptable Range
Bromofluorobenzene	96	%	29 - 137

ND = Not Detected

Aromatic Volatile Organics
Method 8020

Client Name: Parsons Engineering Science
Client ID: 43B86 (4.50,5.00,)
LAB ID: 116457-0012-SA
Matrix: SOIL
Authorized: 18 DEC 95
Instrument: GC/PID-VKA

Sampled: 15 DEC 95
Prepared: 19 DEC 95
Dilution: 1.0

Received: 16 DEC 95
Analyzed: 19 DEC 95

Parameter	Result	Qualifier	RL	Units
Benzene	ND		1.0	ug/kg
Toluene	ND		5.2	ug/kg
Ethylbenzene	ND		5.2	ug/kg
Xylenes (total)	ND		5.2	ug/kg

Surrogate	Recovery	Acceptable Range
Bromofluorobenzene	88 %	30 - 137

Percent moisture is 4.6%. All results and limits are reported on a dry weight basis.

ND = Not Detected

QC LOT ASSIGNMENT REPORT - MS QC
GC/MS Preparation

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK/LCS)	MS QC Run Number (SA,MS,SD,DU)
116457-0001-SA	SOLID	MOISTURE-S			20 DEC 95-AA
116457-0002-SA	SOLID	MOISTURE-S			20 DEC 95-AA
116457-0003-SA	SOLID	MOISTURE-S			20 DEC 95-AA
116457-0004-SA	SOLID	MOISTURE-S			20 DEC 95-AA
116457-0005-SA	SOLID	MOISTURE-S			20 DEC 95-AA
116457-0006-SA	SOLID	MOISTURE-S			20 DEC 95-AA
116457-0007-SA	SOLID	MOISTURE-S			20 DEC 95-AA
116457-0008-SA	SOLID	MOISTURE-S			20 DEC 95-AA
116457-0009-SA	SOLID	MOISTURE-S			20 DEC 95-AA
116457-0012-SA	SOLID	MOISTURE-S			20 DEC 95-AA

MATRIX DUPLICATE QC REPORT
GC/MS Preparation
Project: 116457

Category: MOISTURE-S Percent Moisture
Matrix: SOLID
Sample: 116457-0001
MS Run: 20 DEC 95-AA
Units: %

Analyte	Concentration		%RPD SA-DU	Acceptance Limit
	Sample	Duplicate		
Percent Water	11.0	11.0	0.0	10

Calculations are performed before rounding to avoid round-off errors in calculated results.

QC LOT ASSIGNMENT REPORT - MS QC
LUFT

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK/LCS)	MS QC Run Number (SA, MS, SD, DU)
116457-0001-SA	SOLID	TEPH-EDW-S		19 DEC 95-EX	19 DEC 95-EA
116457-0001-SA	SOLID	TVPH-EDW-S		19 DEC 95-A1X	19 DEC 95-AA
116457-0002-SA	SOLID	TEPH-EDW-S		19 DEC 95-EX	19 DEC 95-EA
116457-0002-SA	SOLID	TVPH-EDW-S		19 DEC 95-A1X	19 DEC 95-AA
116457-0003-SA	SOLID	TEPH-EDW-S		19 DEC 95-EX	19 DEC 95-EA
116457-0003-SA	SOLID	TVPH-EDW-S		19 DEC 95-A1X	19 DEC 95-AA
116457-0004-SA	SOLID	TEPH-EDW-S		19 DEC 95-EX	19 DEC 95-EA
116457-0004-SA	SOLID	TVPH-EDW-S		19 DEC 95-A1X	19 DEC 95-AA
116457-0005-SA	SOLID	TEPH-EDW-S		19 DEC 95-EX	19 DEC 95-EA
116457-0005-SA	SOLID	TVPH-EDW-S		19 DEC 95-A1X	19 DEC 95-AA
116457-0006-SA	SOLID	TEPH-EDW-S		19 DEC 95-EX	19 DEC 95-EA
116457-0006-SA	SOLID	TVPH-EDW-S		19 DEC 95-A1X	19 DEC 95-AA
116457-0007-MS	SOLID	TEPH-EDW-S		19 DEC 95-EX	19 DEC 95-EA
116457-0007-MS	SOLID	TVPH-EDW-S		19 DEC 95-A1X	19 DEC 95-AA
116457-0007-SA	SOLID	TEPH-EDW-S		19 DEC 95-EX	19 DEC 95-EA
116457-0007-SA	SOLID	TVPH-EDW-S		19 DEC 95-A1X	19 DEC 95-AA
116457-0007-SD	SOLID	TEPH-EDW-S		19 DEC 95-EX	19 DEC 95-EA
116457-0007-SD	SOLID	TVPH-EDW-S		19 DEC 95-A1X	19 DEC 95-AA
116457-0008-SA	SOLID	TEPH-EDW-S		19 DEC 95-EX	19 DEC 95-EA
116457-0008-SA	SOLID	TVPH-EDW-S		19 DEC 95-A1X	19 DEC 95-AA
116457-0009-SA	SOLID	TEPH-EDW-S		19 DEC 95-EX	19 DEC 95-EA
116457-0009-SA	SOLID	TVPH-EDW-S		19 DEC 95-A1X	19 DEC 95-AA
116457-0010-TB	AQUEOUS	TVPH-EDW-A		19 DEC 95-BCX	
116457-0011-EB	AQUEOUS	TVPH-EDW-A		19 DEC 95-BCX	
116457-0011-EB	AQUEOUS	TEPH-EDW-A	19 DEC 95-B	19 DEC 95-B	
116457-0012-SA	SOLID	TEPH-EDW-S		19 DEC 95-EX	19 DEC 95-EA
116457-0012-SA	SOLID	TVPH-EDW-S		19 DEC 95-A1X	19 DEC 95-AA

DUPLICATE CONTROL SAMPLE REPORT

LUFT

Project: 116457

Category: TEPH-EDW-A Method CADHS - Total Extractable Petroleum Hydrocarbons

Matrix: AQUEOUS

QC Lot: 19 DEC 95-B

Date Analyzed: 21 DEC 95

Concentration Units: mg/L

Analyte	Spiked	Concentration				Accuracy		Precision	
		Measured		AVG		Average (%)		(RPD)	
		DCS1 Qual	DCS2 Qual			DCS	Limits	DCS	Limit
Diesel Fuel #2	5.00	5.05	4.84	4.95		99	34-134	4.2	33
Benzo(a)pyrene	0.250	0.228	0.217	0.222		89	50-150	4.9	0

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE REPORT

LUFT

Project: 116457

Category: TEPH-EDW-S Method CADHS - Total Extractable Petroleum Hydrocarbons
Matrix: SOLID Date Analyzed: 20 DEC 95
QC Run: 19 DEC 95-EX
Concentration Units: mg/kg

Analyte	Concentration		Accuracy(%)	
	Spiked	Measured	LCS	Limits
Diesel Fuel #2	250	235	94	42-146
Benzo(a)pyrene	12.5	11.0	88	50-150

Category: TVPH-EDW-S Method CADHS - Total Volatile Petroleum Hydrocarbons
Matrix: SOLID Date Analyzed: 19 DEC 95
QC Run: 19 DEC 95-A1X
Concentration Units: mg/kg

Analyte	Concentration		Accuracy(%)	
	Spiked	Measured	LCS	Limits
Gasoline	5.00	3.76	75	67-126
a,a,a-Trifluorotoluene	0.200	0.151	76	50-150

Category: TVPH-EDW-A Method CADHS - Total Volatile Petroleum Hydrocarbons
Matrix: AQUEOUS Date Analyzed: 19 DEC 95
QC Run: 19 DEC 95-BCX
Concentration Units: mg/L

Analyte	Concentration		Accuracy(%)	
	Spiked	Measured	LCS	Limits
Gasoline	1.00	0.836	84	63-130
a,a,a-Trifluorotoluene	0.0400	0.0431	108	50-150

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT

LUFT

Project: 116457

Category: TEPH-EDW-S Method CADHS - Total Extractable Petroleum Hydrocarbons

Matrix: SOLID

Sample: 116457-0007

MS Run: 19 DEC 95-EA

Units mg/kg Units Qualifier: Wet weight

Analyte	Sample Result	Concentration		Amount Spiked MS/MSD	%Recovery		%RPD	Acceptance Limit	
		MS Result	MSD Result		MS	MSD		Recov.	RPD
Diesel Fuel #2	ND	222	224	250	89	90	0.8	10-178	42

Surrogates	Sample %Recovery	%Recovery MS	MSD	Acceptance Limit Recovery
Benzo(a)pyrene	84	83	83	50-150

Category: TVPH-EDW-S Method CADHS - Total Volatile Petroleum Hydrocarbons

Matrix: SOLID

Sample: 116457-0007

MS Run: 19 DEC 95-AA

Units mg/kg Units Qualifier: Wet weight

Analyte	Sample Result	Concentration		Amount Spiked MS/MSD	%Recovery		%RPD	Acceptance Limit	
		MS Result	MSD Result		MS	MSD		Recov.	RPD
Gasoline	ND	4.18	3.86	5.00	84	77	8.0	50-126	35

Surrogates	Sample %Recovery	%Recovery MS	MSD	Acceptance Limit Recovery
a,a,a-Trifluorotoluene	84	67	77	50-150

ND = Not Detected

Calculations are performed before rounding to avoid round-off errors in calculated results.

SINGLE CONTROL SAMPLE REPORT
LUFT
Project: 116457

Category: TEPH-EDW-S Method CADHS - Total Extractable Petroleum Hydrocarbons
Matrix: SOLID
QC Run: 19 DEC 95-EX Date Analyzed: 20 DEC 95
Concentration Units: mg/kg

Analyte	Concentration		Accuracy(%)	
	Spiked	Measured	SCS	Limits
Benzo(a)pyrene	12.5	11.1	89	50-150

Category: TVPH-EDW-S Method CADHS - Total Volatile Petroleum Hydrocarbons
Matrix: SOLID
QC Run: 19 DEC 95-A1X Date Analyzed: 19 DEC 95
Concentration Units: mg/kg

Analyte	Concentration		Accuracy(%)	
	Spiked	Measured	SCS	Limits
a,a,a-Trifluorotoluene	0.200	0.180	90	50-150

Category: TVPH-EDW-A Method CADHS - Total Volatile Petroleum Hydrocarbons
Matrix: AQUEOUS
QC Run: 19 DEC 95-BCX Date Analyzed: 19 DEC 95
Concentration Units: mg/L

Analyte	Concentration		Accuracy(%)	
	Spiked	Measured	SCS	Limits
a,a,a-Trifluorotoluene	0.0400	0.0428	107	50-150

Category: TEPH-EDW-A Method CADHS - Total Extractable Petroleum Hydrocarbons
Matrix: AQUEOUS
QC Run: 19 DEC 95-B Date Analyzed: 21 DEC 95
Concentration Units: mg/L

Analyte	Concentration		Accuracy(%)	
	Spiked	Measured	SCS	Limits
Benzo(a)pyrene	0.250	0.216	86	50-150

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT
LUFT
Project: 116457

Test: TEPH-EAFB-S Method CADHS - Total Extractable Petroleum Hydrocarbons
Matrix: SOLID
QC Run: 19 DEC 95-EX Date Analyzed: 20 DEC 95

Analyte	Result	Units	Reporting Limit
Diesel Fuel #2	ND	mg/kg	10
Unknown extractable hydrocarbon	ND	mg/kg	10

Test: TVPH-EAFB-S Method CADHS - Total Volatile Petroleum Hydrocarbons
Matrix: SOLID
QC Run: 19 DEC 95-A1X Date Analyzed: 19 DEC 95

Analyte	Result	Units	Reporting Limit
Gasoline	ND	mg/kg	1.0
Unknown volatile hydrocarbon	ND	mg/kg	1.0

Test: TVPH-EAFB-A Method CADHS - Total Volatile Petroleum Hydrocarbons
Matrix: AQUEOUS
QC Run: 19 DEC 95-BCX Date Analyzed: 19 DEC 95

Analyte	Result	Units	Reporting Limit
Gasoline	ND	mg/L	0.10
Unknown volatile hydrocarbon	ND	mg/L	0.10

Test: TEPH-EAFB-A Method CADHS - Total Extractable Petroleum Hydrocarbons
Matrix: AQUEOUS
QC Run: 19 DEC 95-B Date Analyzed: 21 DEC 95

Analyte	Result	Units	Reporting Limit
Diesel Fuel #2	ND	mg/L	1.0
Unknown extractable hydrocarbon	ND	mg/L	1.0

ND = Not Detected



Environmental
Services

QC LOT ASSIGNMENT REPORT - MS QC
Volatile Organics by GC

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK/LCS)	MS QC Run Number (SA,MS,SD,DU)
116457-0001-SA	SOLID	8020-S		19 DEC 95-AKX	19 DEC 95-AA
116457-0002-SA	SOLID	8020-S		19 DEC 95-AKX	19 DEC 95-AA
116457-0003-SA	SOLID	8020-S		19 DEC 95-AKX	19 DEC 95-AA
116457-0004-SA	SOLID	8020-S		19 DEC 95-AKX	19 DEC 95-AA
116457-0005-SA	SOLID	8020-S		19 DEC 95-AKX	19 DEC 95-AA
116457-0006-SA	SOLID	8020-S		19 DEC 95-AKX	19 DEC 95-AA
116457-0007-MS	SOLID	8020-S		19 DEC 95-AKX	19 DEC 95-AA
116457-0007-SA	SOLID	8020-S		19 DEC 95-AKX	19 DEC 95-AA
116457-0007-SD	SOLID	8020-S		19 DEC 95-AKX	19 DEC 95-AA
116457-0008-SA	SOLID	8020-S		19 DEC 95-AKX	19 DEC 95-AA
116457-0009-SA	SOLID	8020-S		19 DEC 95-AKX	19 DEC 95-AA
116457-0010-TB	AQUEOUS	8020-A	19 DEC 95-AK	21 DEC 95-AK	
116457-0011-EB	AQUEOUS	8020-A	19 DEC 95-AK	21 DEC 95-AK	
116457-0012-SA	SOLID	8020-S		19 DEC 95-AKX	19 DEC 95-AA

DUPLICATE CONTROL SAMPLE REPORT
Volatile Organics by GC
Project: 116457

Category: 8020-A Aromatic Volatile Organics
Matrix: AQUEOUS
QC Lot: 19 DEC 95-AK
Concentration Units: ug/L

Date Analyzed: 21 DEC 95

Analyte	Spiked	Concentration			Accuracy		Precision	
		DCS1	Qual	DCS2 Qual	AVG	Average (%)	(RPD)	DCS Limit
						DCS Limits		
Benzene	10.0	9.70		9.99	9.85	98 35-143	2.9	28
Toluene	10.0	10.2		10.6	10.4	104 50-142	3.1	37
Ethylbenzene	10.0	9.70		10.0	9.86	99 53-135	3.2	36
Xylenes (total)	30.0	28.6		29.6	29.1	97 40-137	3.4	30
1,3-Dichlorobenzene	10.0	9.61		9.73	9.67	97 40-142	1.2	33

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE REPORT
Volatile Organics by GC
Project: 116457

Category: 8020-S Aromatic Volatile Organics
Matrix: SOLID
QC Run: 19 DEC 95-AKX
Concentration Units: ug/kg

Date Analyzed: 19 DEC 95

Analyte	Concentration		Accuracy(%)	
	Spiked	Measured	LCS	Limits
Benzene	0.0100	0.00863	86	46-129
Toluene	0.0100	0.00906	91	53-130
Ethylbenzene	0.0100	0.00860	86	51-132
Xylenes (total)	0.0300	0.0253	84	42-129
1,3-Dichlorobenzene	0.0100	0.00878	88	51-131

Category: 8020-A Aromatic Volatile Organics
Matrix: AQUEOUS
QC Run: 21 DEC 95-AK
Concentration Units: ug/L

Date Analyzed: 21 DEC 95

Analyte	Concentration		Accuracy(%)	
	Spiked	Measured	LCS	Limits
Benzene	10.0	9.70	97	35-143
Toluene	10.0	10.2	102	50-142
Ethylbenzene	10.0	9.70	97	53-135
Xylenes (total)	30.0	28.6	95	40-137
1,3-Dichlorobenzene	10.0	9.61	96	40-142

Calculations are performed before rounding to avoid round-off errors in calculated results.



Environmental
Services

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT
Volatile Organics by GC
Project: 116457

Category: 8020-S Aromatic Volatile Organics
Matrix: SOLID
Sample: 116457-0007
MS Run: 19 DEC 95-AA
Units ug/kg Units Qualifier: Wet weight

Analyte	Sample Result	Concentration		Amount Spiked MS/MSD	%Recovery		%RPD	Acceptance Limit	
		MS Result	MSD Result		MS	MSD		Recov.	RPD
Benzene	ND	0.00890	0.00943	0.0100	89	94	5.8	41-128	20
Toluene	ND	0.00938	0.0100	0.0100	94	100	6.4	39-137	20
Ethylbenzene	ND	0.00877	0.00935	0.0100	88	94	6.4	46-127	20
Xylenes (total)	ND	0.0260	0.0276	0.0300	87	92	6.0	38-124	30

ND = Not Detected

Calculations are performed before rounding to avoid round-off errors in calculated results.



Environmental
Services

SINGLE CONTROL SAMPLE REPORT
Volatile Organics by GC
Project: 116457

Category: 8020-S Aromatic Volatile Organics
Matrix: SOLID
QC Run: 19 DEC 95-AKX
Concentration Units: ug/kg

Date Analyzed: 19 DEC 95

Analyte	Concentration		Accuracy(%)	
	Spiked	Measured	SCS	Limits
Bromofluorobenzene	20.0	17.6	88	30-137

Category: 8020-A Aromatic Volatile Organics
Matrix: AQUEOUS
QC Run: 21 DEC 95-AK
Concentration Units: ug/L

Date Analyzed: 21 DEC 95

Analyte	Concentration		Accuracy(%)	
	Spiked	Measured	SCS	Limits
Bromofluorobenzene	20.0	18.4	92	29-137

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT
Volatile Organics by GC
Project: 116457

Method 8020 - Benzene, Toluene, Ethyl Benzene and Xylenes
(BTEX)

Test: 8020-BTXE-S
Matrix: SOLID
QC Run: 19 DEC 95-AKX

Date Analyzed: 19 DEC 95
Reporting
Limit

Analyte	Result	Units	Limit
Benzene	ND	ug/kg	1.0
Toluene	ND	ug/kg	5.0
Ethylbenzene	ND	ug/kg	5.0
Xylenes (total)	ND	ug/kg	5.0

Method 8020 - Benzene, Toluene, Ethylbenzene and Xylenes
(BTXE)

Test: 8020-BTXE-A
Matrix: AQUEOUS
QC Run: 21 DEC 95-AK

Date Analyzed: 21 DEC 95
Reporting
Limit

Analyte	Result	Units	Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	1.0
Ethylbenzene	ND	ug/L	1.0
Xylenes (total)	ND	ug/L	1.0

ND = Not Detected